

**Roanoke River  
National Wildlife Refuge**

**Annual Narrative**

Windsor, North Carolina  
Calendar Year 2011

# *Table of Contents*

**Forward**  
**Introduction**  
**Highlights**  
**Climate Data/Hydrograph**

<b>Monitoring and Studies .....</b>	
1a. Surveys and Censuses .....	1
1b. Studies and Investigations.....	15
<b>Habitat Restoration .....</b>	
2a. Wetland restoration: On-Refuge .....	20
2b. Upland restoration: On-Refuge.....	20
2c. Wetland restoration: Off-Refuge.....	21
2d. Upland restoration: Off-Refuge .....	21
<b>Habitat Management.....</b>	
3a. Manage water levels.....	22
3b. Manage moist soil units .....	22
3c. Graze/mow/hay .....	23
3d. Forest cutting .....	23
3e. Control pest plants.....	23
<b>Fish and Wildlife Management.....</b>	
4a. Bird banding.....	25
4b. Disease monitoring and treatment .....	25
4c. Reintroductions .....	25
4d. Provide nest structures .....	25
4e. Predator and exotic control .....	25
<b>Coordination Activities.....</b>	
5a(1). Interagency coordination.....	26
5a(2). Intra-agency coordination.....	35
5b(1). Private land activities (Easements) .....	36
5b(2). Private land activities (Partners) .....	38
5c. Cooperative/Friends Organizations.....	38
<b>Resource Protection .....</b>	
6a. Law enforcement.....	40
6b. Wildfire preparedness .....	40
6c. Manage permits and economic uses.....	40
6d. Contaminant investigation and cleanup .....	40
6e. Manage water rights.....	40
6f. Manage cultural resources .....	41
6g. Federal facility compliance act .....	41

6h. Land acquisition.....	41
6i. Wilderness and natural areas .....	41
6j. Threats and conflicts.....	41

**Public Education and Recreation.....**

7a. Provide visitor services .....	42
7b. Outreach.....	42

**Planning and Administration.....**

8a. Comprehensive management planning .....	44
8b. General administration.....	44

**Feedback**

## FORWARD

Annual Narratives are no longer required by the Service. Roanoke River National Wildlife Refuge (Refuge) will continue to produce an Annual Narrative for the Refuge files. As the Narratives are no longer a required document the Refuge has made some changes in the format and removed the sections that do not pertain to this Refuge.

In 2004, after ten years of meetings, the Roanoke River National Wildlife Refuge (Refuge) staff and other stakeholders came to settlement in the cooperative FERC relicensing with Dominion Generation (DG) and on March 31, 2004, DG was issued a new license. The license was amended in March 2005 to replace articles requiring DG to cooperate with the various agencies that make up the Cooperative Management Team (CMT) and to conduct studies and monitor the impacts of the managed flows on resources downstream of the dam. The CMT was made up of representatives from North Carolina Wildlife Resources Commission, the North Carolina Department of Environment and Natural Resources, the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service, and the Regional Partnership of Local Governments in an ex-officio capacity. The staff's input has been through participation in the Fisheries and Terrestrial Committees.

River flow would determine, to a very large degree, the success of the FWS's potential refuge habitat management strategies. The Refuge staff has always, since early in the relicensing process in 1994, recognized that DG (formerly North Carolina Power) was a lesser player in river flow management decisions. The belief was, and continues to be, that the United States Army Corps of Engineers (USACOE) was the major player through flood control operations. However, when one considers the extent that the USACOE is also involved in hydro-power production, it gives one cause-to-pause regarding the driving force behind the USACOE's flood waters release policies. For instance, when winter flood releases are such that prolonged, moderate flows cause water to remain on the floodplain far into the growing season of spring, one could question the objective. Is it flood control or hydro-power production to fulfill contracts with Southeastern Power Administration? If releases are to prevent flood damage, why are they such that the resources in the lower ecosystem, including the Refuge, are damaged? If the USACOE Project, Kerr Dam, was built for flood control or to prevent flood damage, why not maintain 35,000 cfs releases in a manner that will disperse flood flows downstream during the dormant season as quickly as possible, mimicking more natural conditions? The 35,000 cfs flows flood the Refuge 14-16" deeper than 20,000 cfs flows, but the latter prolongs, sometimes by several weeks, flood releases.

Refuge staff continue to participate in various task group meetings ranging from downstream ecosystem, water quality, and recreation, to channel morphology. It is in these task groups that issues are being discussed and studies are designed to address them.



## INTRODUCTION

The Roanoke River National Wildlife Refuge (Refuge) was established 10 August 1989, to protect and enhance wooded wetlands consisting of bottomland hardwoods and swamps with high waterfowl value along the Roanoke River (River). The Refuge acquisition boundary involves wetlands in a 130-mile section of the River from the fall line in Weldon downstream to the Albemarle Sound near Plymouth, North Carolina. This area of floodplain encompasses approximately 150,000 acres (235 square miles) of which 33,000 acres are in the Refuge acquisition boundary. Current Refuge acreage totals 20,978. North Carolina Wildlife Resources Commission (NCWRC) acquisition totals approximately 26,000 acres. Both agencies' lands are managed as a joint venture, between the U.S. Fish and Wildlife Service and NCWRC, with the exception of a 45-acre fee title easement in Nash County. The Refuge headquarters office is located in the Town of Windsor in Bertie County, North Carolina.

The portion of the Refuge along the River includes part of an extensive wetland ecosystem that contains excellent examples of a number of southeastern plant communities. These are grouped into three natural community types: levee forest, cypress-gum swamp, and bottomland hardwoods. The 45-acre Nash County satellite includes a beaver impounded stream with button bush cover. The 129-acre Sampson County satellite consists of pocosin wetlands.

The River floodplain is relatively narrow from Weldon to Scotland Neck, at times only a mile in width, with natural levees and ridges alternating with sloughs and backswamps in rapid succession. Current Refuge acreage does not include lands in this upper River reach. In the middle section of the lower River, the floodplain becomes flatter and broader, commonly reaching a width of two to three miles, with cypress-gum backswamps increasing in size. The continued presence of levees and ridges make this stretch of floodplain the most diverse and, potentially, the most productive. There are 15,000 acres of Refuge lands in this lower-middle River reach. Below Jamesville the River is essentially at sea level and broad expanses of cypress-gum swamp, as much as five miles across, predominate. In addition to the major vegetation communities described above, occasional oxbow lakes, beaver ponds, and blackwater streams are located throughout and add to the rich mosaic of habitat types in the River's floodplain. Together, these habitats support a rich array of diverse and abundant fish and wildlife species. A total of 6,000 acres in this River reach are designated Refuge lands.

The River floodplain includes some of the more valuable wetlands for fish and wildlife. Fourteen species of waterfowl regularly utilize the floodplain's wetlands. Wood ducks, mallards and wigeon are the most abundant. Other frequently observed species are black duck, pintail, gadwall, green-winged teal, blue-winged teal, ring-necked duck, hooded merganser, shoveler, bufflehead, Canada goose, and tundra swan.

At least 214 species of birds, including 88 breeding resident and migratory species, utilize the River's floodplain. The area supports the highest density of nesting birds, especially songbirds, anywhere in North Carolina. The project area has several rookeries

that contain great blue herons, snowy and great egrets, anhingas, and yellow-crowned night herons.

The River, its tributaries and associated floodplain wetlands, provide critical habitat for a diversity of fish species, including anadromous fish. Anadromous fish utilizing the system are striped bass, blueback herring, alewife, hickory shad, and American shad. The status of the endangered shortnose sturgeon is unknown.

The River's floodplain also has a high density of white-tailed deer. A remnant population of black bear exists along the lower River. Gray squirrels and marsh rabbits are abundant. Resident furbearers include raccoon, mink, muskrat, otter, fox, bobcat, beaver, and opossum.

The River's bottomland hardwood habitat supports one of the largest natural wild turkey populations in North Carolina. The prime bottomland hardwood trees on the ancient river ridges and terraces provide excellent food and cover for feeding and nesting turkeys. Limited woodcock also occur along the River. Bobwhite quail occurred in some of the bottomland hardwood habitats in the early 90's, but have not been heard since approximately 1995.

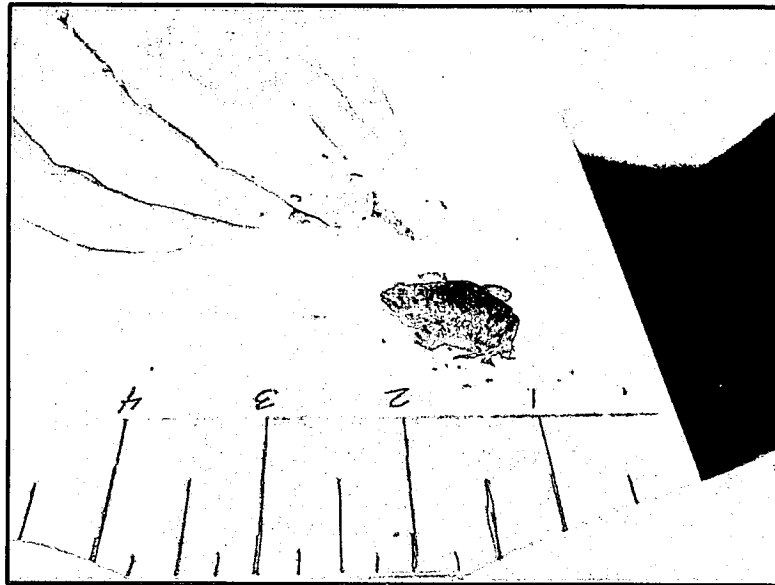
Historical economical uses have been commercial fishing and logging. Logging operations were aimed primarily toward harvesting cypress and green ash. Some cypress-tupelo swamps have been changed to mainly tupelo with a few scattered cypress. Some areas have only small quantities of the ash component. Recreational uses are primarily hunting and fishing.

The Refuge also administers 66 conservation easements consisting of approximately 116 sub-tracts, totaling 2,871 acres. These easements are located in 19 counties, some as far away as 200 miles from Refuge headquarters. The easement and private lands programs were elevated in 1996 with the addition of one staff position, a Private Lands Biologist. When the Private Lands Biologist transferred in 2001, the position was moved to the U.S. Fish and Wildlife Service Wildlife Habitat Management Office, Manteo, NC; however, the easements remained the responsibility of the Refuge. These parcels are generating ever-increasing demands. Shortfalls in staffing have placed the easements as a low priority.

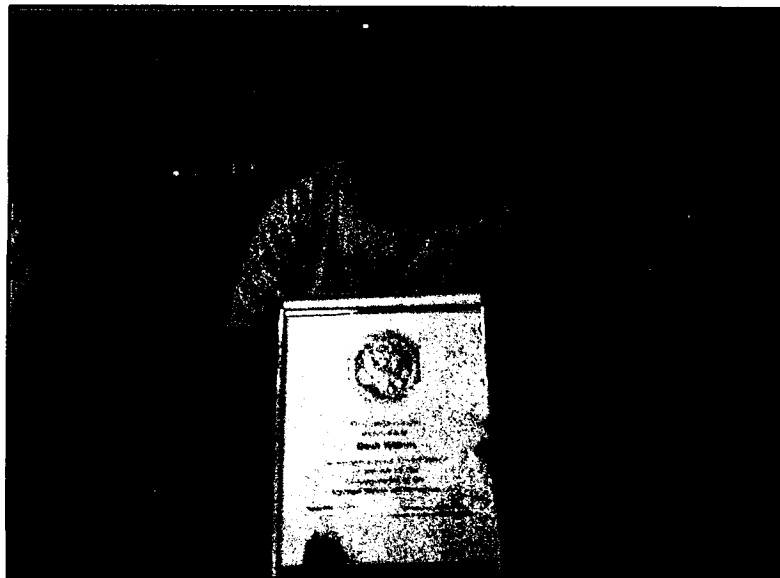
Farm Service Agency (old FmHA) lands inventory also generated two fee title tracts totaling 174 acres; 45 acres in Nash County and 129 acres in Sampson County. There has been minimal management of these satellite areas. These small satellites, 100-200 miles from the Refuge headquarters, create many unique problems.

## HIGHLIGHTS

- The first ever Herp Blitz was carried out this year on the Refuge, 4-5 June.
- WB Richter completed a final draft of the Refuge Habitat Management Plan and sent it out for staff review on 2 Dec
- WB Refuge Staff continued to work with TNC, USACOE, DG, and NC and VA State officials regarding flow issues on the Roanoke River.
- OA Jager was appointed the Service's Junior Duck Stamp Coordinator, North Carolina.
- A Plantation Herpetofaunal Study was initiated on the Refuge's Town Swamp and Broadneck Tracts.
- EEO Wilkins received his 30 year Service pin and certificate.



BT Railey measures a frog



Congratulations EEO on your 30 years of Service!

## CLIMATOLOGICAL REVIEW - 2011

### Temperatures (in Fahrenheit)

Average high: 73.5  
Average low: 49.5  
Highest recorded: 102.9 (22 and 23 July)  
Lowest recorded: 16.0 (14 January)

### Precipitation (in inches)

Total for the year: 45.29      30 yr average: 47.20

Data was recorded at the Peanut Belt Research Station in Lewiston, NC, which is approximately 20 miles from Refuge headquarters, and obtained from the State Climate Office of North Carolina. All data (100%) was available for 2010.

There was one noted winter weather event that brought freezing rain and a trace of snow to the area on 10-11 January otherwise there were no other mentionable winter weather events for the year. Lewiston, snow event records are from <http://www.erh.noaa.gov/rah/events/>. Temperatures varied considerably during the winter months with the daily highs ranging from the low 30's to topping out at 81.0 on 28 February. The month of February was the start of spring for us this year with daily maximum temperatures in the 60's and 70's being common and the last two days of the month topping out at 80.0 and 81.0 degrees respectfully. The warm temperatures continued through the spring with temperatures in the 90's arriving in late May. A hot summer followed; from 18 June through 29 August, there were 58 days of temperatures recorded in the 90's; five of which were temperatures greater than 100. The year ended with temperatures ranging a few degrees higher than the ten year average.

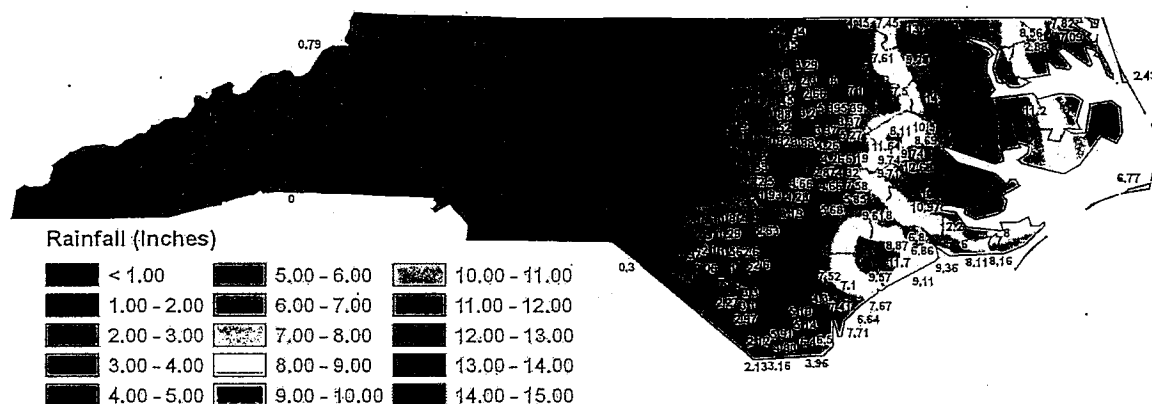
Drought conditions in North Carolina continued to vary throughout the year. 2011 began with most of North Carolina's middle counties under Abnormally Dry to Moderate Drought Conditions. Conditions steadily worsened through spring and summer with the easternmost counties reaching Severe to Extreme Drought conditions. Only North Carolina's Mountain Region escaped drought conditions during this time. Conditions slowly improved and we ended the year with most of the eastern half of the State under Abnormally Dry to Moderate Drought conditions.

Table 1. Summary of temperature and precipitation data for 2011.

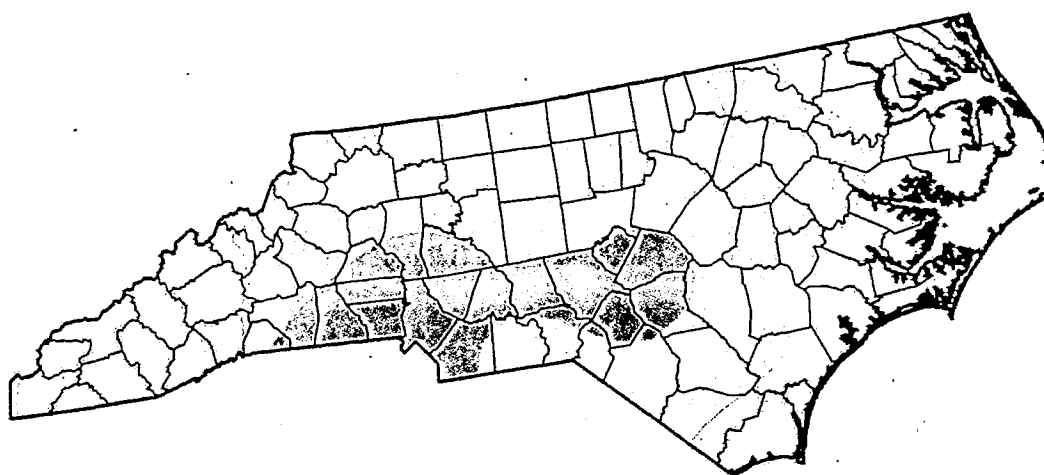
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Max. temp (F)	47.3	59.5	61.6	78.5	81.5	90.2	94.3	90.2	83.1	71.8	67.8	59.5
Avg. Min. temp (F)	27.7	33.6	37.7	50.6	56.1	64.6	68.2	67.9	55.3	47.1	40.5	35.6
Total ppt. (in.)	1.9	1.7	4.58	3.7	1.82	1.78	5.55	12.3	6.31	1.66	3.12	0.82

There was one hurricane this year that made landfall. Hurricane Irene made landfall on the North Carolina Outer Banks as a Category One hurricane on 27 August. She stalled out over eastern North Carolina, pounding the coast with sustained winds of approximately 80 mph. Wind gusts topped out at 115 mph and caused localized flooding, dumping 10-15 inches of rain across several eastern river basins including the Roanoke, Chowan, Neuse, and Tar. The heavy rainfall over the lower Roanoke River Basin, below Roanoke Rapids Dam, followed by subsequent runoff caused dissolved oxygen levels to drop. A couple of days after the storm fish could be seen at the surface of the water gasping for air. Within a week many of the fish succumbed resulting in a fish kill from the vicinity of Williamston to the mouth of the river. The kill was considered a natural event. With the reservoirs low after a dry summer, there wasn't much water available to release from Roanoke Rapids Dam to move the sour water out of the system. After pleas from the resource agencies, water managers were moved to release a daily average of 7,000 cfs for three days. Oxygen levels improved at the Oak City water quality station but had minimal effect at the Williamston, Jamesville, and Westover stations. It took approximately two weeks for oxygen levels to return to 5 mg/L or above.






## NC Rainfall - Hurricane Irene



# US Drought Monitor of NORTH CAROLINA

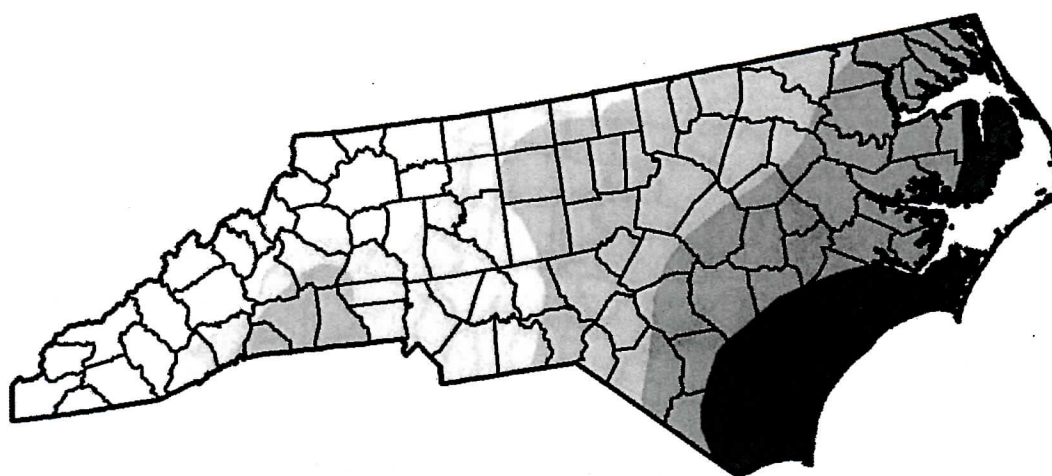


## Drought Severity






-  D0 - Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

January 4, 2011

# US Drought Monitor of NORTH CAROLINA



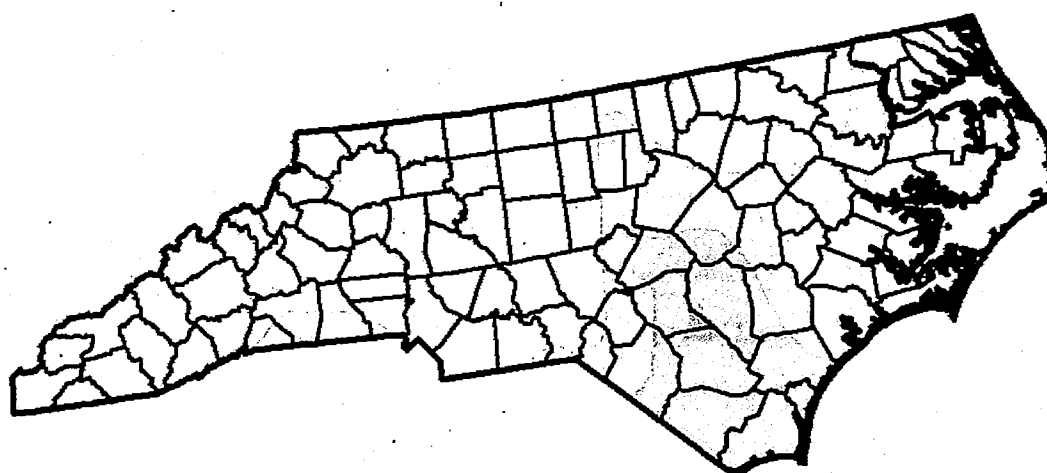
## Drought Severity

-  D0 - Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

July 5, 2011



# US Drought Monitor of NORTH CAROLINA



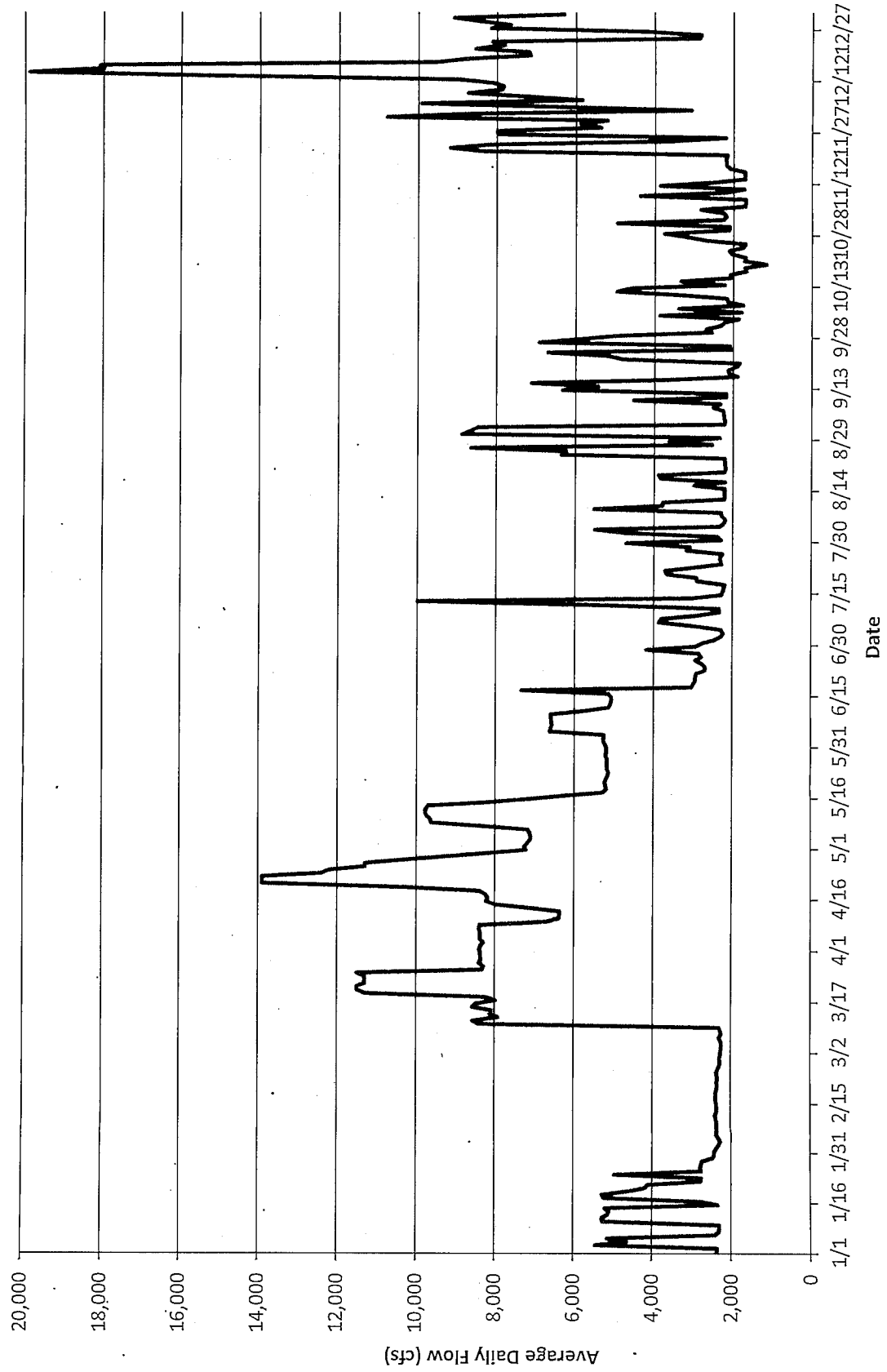
## Drought Severity

- D0 - Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

December 27, 2011

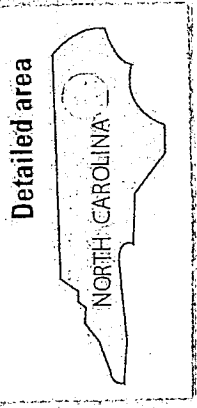
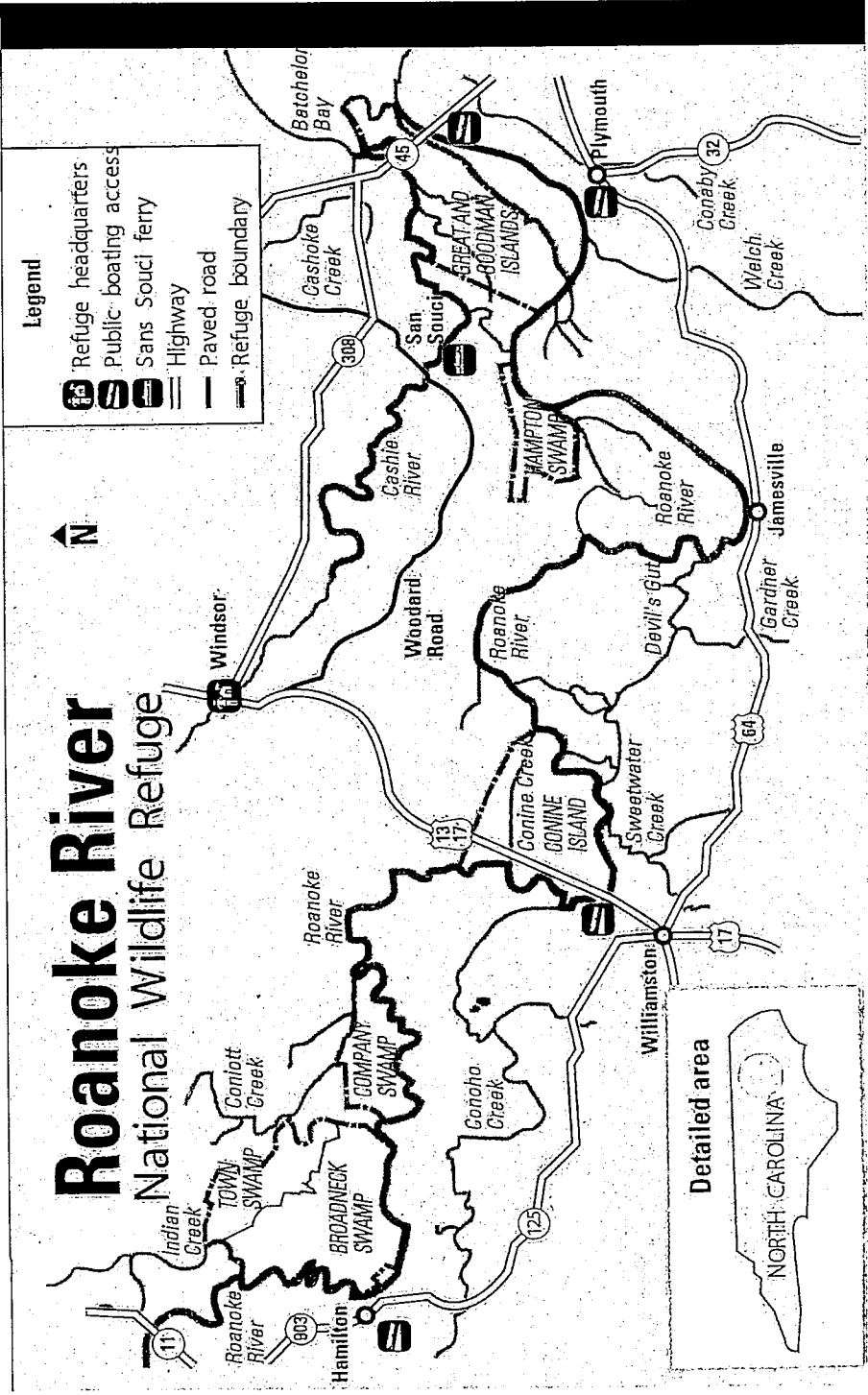


Discharge from Roanoke Rapids, NC  
2011



# Roanoke River National Wildlife Refuge

- Legend**
- Refuge headquarters
  - Public boating access
  - Sans Souci ferry
  - Highway
  - Paved road
  - Refuge boundary



# 1

## *Monitoring and Studies*

### *1a. Surveys and Censuses*

Notable wildlife occurrences at Roanoke River National Wildlife Refuge (Refuge) in 2011:

- A pair of bald eagles nested again this year on the Company Swamp tract.

Monitoring Wood Duck Productivity – An overall summary of productivity is outlined followed by a more detailed summary of box clusters below in Table 1. The overall productivity of wood duck boxes was similar to last year. A total of 600 eggs were produced in 48 boxes with 352 eggs hatched as compared to 524 eggs produced in 2010 in 50 boxes in which 316 hatched. In an effort to reduce the occurrence of prothonotary warblers building their nests in wood duck boxes, 12 nest structures were given to the Refuge by Dr. Eugene Hester. The structures consist of a Metamucil container with its top painted black and an entrance hole drilled in the front. Holes were drilled in the bottom for drainage and on the back to weave an anchor wire through. In 2009 WB Richter along with volunteer Jim Brown affixed all twelve structures to the back of the poles of those wood duck boxes that had repeat occurrences of warbler use over the years. This was the first year the warblers used the structures affixed to the post of the wood duck boxes. Two of the twelve structures were used this year. The paper wasps still seem to prefer building their nests on the underside of the lid.

Eight boxes remain on the lower Roanoke River. The rest were previously taken down due to problems with dump nesting, corroding hardware, and predator guards. The eight boxes were checked in June and December (2011). Nesting attempts by wood ducks were made in six boxes. Dump nests (>20 eggs in a clutch) occurred in none of the boxes this year. The total number of eggs laid was 81, including 67 (83%) hatched and 25(31%) unhatched.

Boxes located on Broad Creek (11 boxes) and Grennell Creek (8 boxes) were monitored and maintained. Of the 19 boxes, 17 had active wood duck nests with 105 (42%) of the 251 eggs hatched. This compares to last year in which 13 (68%) active wood duck boxes were observed with a total number of 139 eggs laid and 96 (69%) hatched. There were four boxes that contained dump nests (>20 eggs) this year and prothonotary warblers or great crested flycatchers didn't use any of the boxes this year compared to five last year.

Twelve boxes were checked on Welch Creek. A total of nine boxes were used by wood ducks this year compared to eight last year. Boxes were checked in July and December

(2011). Data collected indicates 147 eggs were laid with 125 (85%) hatching. Prothonotary warbler nests were found in three of the boxes.

The Eastmost River has nine boxes of which four were used by wood ducks compared to five last year. Of the four boxes used, 58 eggs were laid compared to last year when 113 eggs were laid. The success increased to 33 (57%) hatched this year from last year's 51 (45%) success rate.

WB Richter cleaned and checked the boxes in Rainbow slough January 2011. A total of 22 wood duck boxes can be found at this location. Ten boxes were used by either wood ducks or hood mergansers. Total number of eggs found was 67, of this 25 (37%) were hooded merganser eggs and 42 (63%) were wood duck eggs. Of the hooded merganser eggs a total of 22 (88%) hatched and 22 (52%) of the wood duck eggs hatched. A flying squirrel nest was found in one box, and one box had both wood duck and hooded merganser eggs present with evidence of both types of eggs having hatched.

**Table 1: Wood duck box productivity data for 2011 on Refuge lands.**

# PROW used / # structures												
# Boxes Predated												
Dump Nests												
# Boxes with POWA Nests												
Hooded Merganser Hatched												
Hooded Merganser NH												
# Dead Chicks												
# WODU Not Hatched) NH												
# WODU Hatched												
Total # Eggs												
Total # Boxes Used by Waterfowl/												
Total Number of Boxes												
Rainbow	22	10	67	22	20	0	3	22	0	0	1	n/a
Lower River	8	6	81	67	25	0	0	0	0	0	0	0/0
Welch Cr.	12	9	147	125	22	13	0	0	1	1	0	2/3
Eastmost	9	4	58	33	13	0	0	0	0	0	0	0/2
Broad/Grennell Cr.	17	17	251	105	197	54	0	0	0	4	4	0/7
TOTAL	68	46	604	352	277	4	3	22	1	5	5	2/12

Cerulean Warbler Survey – WB Richter collaborated with John Carpenter, Wildlife Diversity Biologist, North Carolina Wildlife Resources Commission (NCWRC) Landbirds, in putting together a survey of the Cerulean warbler on the lower Roanoke River (area below Roanoke Rapids Dam). On 14 - 15 and 28 - 29 May a 100-mile stretch of the river was surveyed. Weather conditions were ideal on 14 - 15 May; however, hearing the warbler's song in the distance over the ringing of the cicadas proved to be difficult on 28 - 29 May. As a result, some birds may have been missed. The survey detected at least 32.4% fewer males in 2011 ( $n = 23$ ) than in the previous survey organized by the Refuge in 2001 ( $n = 34$ ). WB Richter and Mr. Carpenter are writing up the results in a paper that will be submitted for publication. A draft of the

abstract of the paper titled "Distribution, Landscape-Level Habitat Associations, and Current Status of the Cerulean Warbler (*Dendroica cerulea*) in the Roanoke River Basin of North Carolina" follows:

**Abstract** – The Cerulean Warbler (*Dendroica cerulea*) has been inadequately monitored along the Roanoke River in North Carolina since a breeding population was discovered there in 1972. Our objectives were to estimate the Cerulean Warbler's current population size and distribution along the river, and evaluate landscape habitat characteristics and changes in land cover in the Roanoke River Basin. In May 2001 and 2011, we surveyed for singing Cerulean Warbler males by boat and foot along approximately 100 miles of the Roanoke River from Weldon to Williamston in northeast North Carolina. We found Cerulean Warblers in three distinct groups along the Roanoke River during both survey years; however, we detected at least 32.4% fewer males in 2011 ( $n = 23$ ) than in 2001 ( $n = 34$ ). From 2001 to 2006, deciduous forest and woody wetlands were lost at an average of 0.6 ha, or 0.8% of the total area within 500 m of detections. The landscape used by Cerulean Warbler males differed from unused and available habitats by a lower percentage of row crop cover, and from unused habitat by less pasture/hay cover and less diverse canopy heights. We recommend continued monitoring of the Cerulean Warbler along the Roanoke River and encourage a more in depth investigation into management strategies to sustain this population.

Roanoke River NWR Breeding Bird Point Count Surveys on Levee and Plantation Habitats – WB Richter conducted point counts on established transects (2 on Broadneck Swamp, 1 on Conine Island, and 1 on Company Swamp) each containing 10 points located 250 m apart. This was the seventh year point count data was collected in the hardwood plantations located on Refuge lands purchased in 2004. Green ash, sycamore, and sweet gum plantations made up the fifteen point count plots in the hardwood plantations. Three additional points were added in the pine plantation across from the maintenance storage area on Town Swamp. Within the next few years plans are to manipulate these plantations to promote more diverse hardwood stands. The point count data will serve as a baseline for comparison after stand manipulation is completed.

Each of the 58 points were visited, at which time birds seen or heard within 25 m, 50 m, and over 50 m were recorded at 0-3 minutes, 4-5 minutes, and 6-10 minutes time intervals. The protocol used is based on the Hamel, et. al. "**A Land Manager's Guide to Point Counts of Birds in the Southeast**" and has been adopted by Regions 4 and 5 with minimal modifications for the use on the Refuge. All points are located 50 m from the River and are in levee habitat. The objectives of this monitoring study are to 1) monitor, overtime, the effects of aseasonal flooding on bird populations; 2) document the density and diversity of birds on the River levees; 3) assist Refuge staff on determining habitat management objectives and priorities for the Refuge; and 4) use the standardized protocol to allow one to compare bird population trends on an ecosystem, regional, and national scale in similar habitat types. The goal is to have a total of 50 points in this one habitat type as recommended by WB Chuck Hunter, FWS Southeast Regional Office.

Table 2 summarizes the 2011 data as it compares to the point count data collected in past years. In reviewing this table, some notable observations are:

- There was not one species that stood out as being significantly more abundant this year than in years past. However, the following species were notably less abundant this year: Eastern tufted titmouse, blue-gray gnat catcher, and prothonotary warbler. There continues to be an evident downward trend in the number of prothonotary warblers on the levee plots with numbers remaining relatively stable on the plantation plots.
- Listed in order of abundance, the five most abundant bird species counted on levee sites in 2011 were: American redstart, Carolina wren, Acadian flycatcher, northern cardinal, and red-eyed vireo. This compares with last year's abundance of Carolina wren, American redstart, Acadian flycatcher, red-eyed vireo, and white-eyed vireo. The average number from previous years (1999-2010) indicates that the five most abundant species were: American redstart, Carolina wren, red-eyed vireo, blue-gray gnatcatcher, and prothonotary warbler.
- On levee sites the most widespread species (species with the highest number of occurrences) listed in order of highest to lowest occurrence were: 1 - American redstart, and Acadian flycatcher; 2 - northern cardinal and Carolina wren; 3 - red-bellied woodpecker; 4 - red-eyed vireo and white-eyed vireo; 5 - eastern tufted mouse. As compared to occurrence of species tallied from 1999-2010 in which the most widespread species was the red-eyed vireo, Carolina wren, Acadian flycatcher, northern cardinal, and American redstart.
- On plantation sites the most widespread species (species with highest number of occurrences) this year listed in order of highest to lowest occurrence were: Acadian flycatcher, red-eyed vireo, American redstart, eastern tufted titmouse, and indigo bunting. As compared to occurrence of species tallied from previous years (2005-2010) in which the most widespread species was the Acadian flycatcher, American redstart, red-eyed vireo, Carolina chickadee, and prothonotary warbler.
- Listed in order of abundance, the five most abundant bird species counted on plantation sites were: American redstart, Acadian flycatcher, red-eyed vireo, Carolina wren, and Carolina chickadee. The average number from previous years (2005-2010) indicates that the five most abundant species were: American redstart, Acadian flycatcher, red-eyed vireo, Carolina wren, and prothonotary warbler.
- As mentioned above, three points were added to the pine plantation. The most abundant species encountered were American redstart and pine warbler. The following species were encountered in all three plots: Acadian flycatcher, American redstart, common yellow throat warbler, great crested flycatcher, indigo bunting, northern cardinal, prothonotary warbler, and red-eyed vireo.

Table 2: Comparative summary of levee and plantation point count data collected on Refuge lands in 2011 to levee point count data collected from 1999-2010.

Species	# Occurrences		Average # Occurrences**/yr.		# Individuals		Average # Individuals/yr.		# Occurrences**		Occurrences**/yr.		# Individuals		# Individuals/yr.	
	Levee Sites	2011	Levee Sites	1999-2010	Levee Sites	2011	Levee Sites	1999-2010	Plantations	2011	Plantations	2005-2010	Plantations	2011	Plantations	2005-2010
Acadian flycatcher	39		37.2		60		53.8		14/3		14.5		27/6		25.5	
American crow	17		16.0		32		23.3		5/2		6.5		5/3		9.2	
American goldfinch	1		0.1		1		0.1		0		0.2		0		0.2	
American redstart	39		36.4		84		73.4		12/3		13.0		28/10		35.7	
Barred owl	6		5.8		8		7.0		2/1		2.5		3/2		2.8	
Belted kingfisher	0		0.2		0		0.2		0		0.0		0		0.0	
Blue grosbeak	3		0.5		3		0.5		3		0.5		3		0.7	
Black-throated blue warbler	0		0.8		0		0.9		0		0.0		0		0.0	
Blackpoll warbler	0		0.6		0		0.7		0		0.0		0		0.0	
Blue jay	5		5.7		6		6.0		1		0.7		1		0.7	
Blue-gray gnatcatcher	18		31.1		35		62.2		4		8.2		8		14.3	
Brown-headed cowbird	9		12.4		11		13.1		1		2.7		1		3.3	
Canada goose	0		2.0		0		4.4		1		1.0		1		2.8	
Carolina chickadee	19		22.8		45		43.6		11		6.7		16/5		10.8	
Carolina wren	36		38.0		66		71.1		8/1		12.3		13/1		19.2	
Cerulean warbler	0		0.4		0		0.4		0		0.0		0		0.0	
Chimney swift	3		4.5		6		6.8		2		2.2		2		4.0	
Common grackle	0		1.8		0		2.3		1		0.7		1		0.7	



Species	#		Average #		#		Average #		Occurrences**		Occurrences**/yr.		#		#	
	Occurrences	Levee Sites	Occurrences**/yr.	Levee Sites	Occurrences	Levee Sites	Occurrences	Levee Sites	Occurrences	Levee Sites	Occurrences	Levee Sites	Occurrences	Levee Sites	Occurrences	Levee Sites
Common yellowthroat warbler	3	3	14.0	14.0	3	3	16.3	16.3	9/3	9/3	7.8	7.8	11/5	11/5	10/8	10/8
Downy woodpecker	8	8	9.0	9.0	8	8	9.2	9.2	4	4	5.7	5.7	5	5	6.0	6.0
Eastern tufted titmouse	28	39	30.6	30.6	39	39	45.0	45.0	11/2	11/2	7.0	7.0	13/2	13/2	8.5	8.5
Eastern wood pewee	17	18	18.3	18.3	18	18	19.1	19.1	2/1	2/1	2.0	2.0	2/1	2/1	2.0	2.0
Fish crow	1	1	2.4	2.4	1	1	2.5	2.5	0	0	0.7	0.7	0	0	0.7	0.7
Northern flicker intergrade	1	1	4.7	4.7	1	1	5.0	5.0	1	1	1.2	1.2	1	1	1.5	1.5
Great blue heron	0	0	1.3	1.3	0	0	1.5	1.5	0	0	0.0	0.0	0	0	0.0	0.0
Great-crowned flycatcher	18	25	23.5	23.5	25	25	28.7	28.7	6/3	6/3	5.5	5.5	6/3	6/3	6.2	6.2
Hairy woodpecker	6	7	4.2	4.2	7	7	4.6	4.6	2	2	2.2	2.2	4	4	3.2	3.2
Hooded warbler	21	22	12.1	12.1	22	22	13.7	13.7	5	5	3.2	3.2	6	6	3.3	3.3
Indigo bunting	12	13	10.8	10.8	13	13	12.1	12.1	10/3	10/3	4.3	4.3	12/6	12/6	4.7	4.7
Kentucky warbler	13	14	9.1	9.1	14	14	10.3	10.3	2/1	2/1	1.8	1.8	2/1	2/1	2.0	2.0
Mississippi kite	1	1	0.1	0.1	1	1	0.1	0.1	0	0	0.0	0.0	0	0	0.0	0.0
Mourning dove	12	14	7.9	7.9	14	14	9.0	9.0	5/1	5/1	2.3	2.3	6/1	6/1	2.8	2.8
Northern cardinal	36	54	36.5	36.5	54	54	52.3	52.3	12/3	12/3	8.8	8.8	14/4	14/4	11.7	11.7
Northern parula warbler	13	30	14.6	14.6	30	30	25.0	25.0	3/1	3/1	0.8	0.8	3/1	3/1	0.8	0.8
Ovenbird	10	12	4.2	4.2	12	12	4.7	4.7	6	6	4.2	4.2	8	8	6.7	6.7
Pileated woodpecker	14	15	13.9	13.9	15	15	15.8	15.8	3/1	3/1	1.5	1.5	4/1	4/1	1.7	1.7
Pine warbler	0	0	0.0	0.0	0	0	0.0	0.0	0/3	0/3	0.0	0.0	0/7	0/7	0.0	0.0
Prothonotary warbler	22	27	32.8	32.8	27	27	57.2	57.2	4	4	10.5	10.5	5	5	14.2	14.2



Species	# Occurrences		Average # Occurrences**/yr.		# Individuals		Average # Individuals/yr.		Occurrences**		Occurrences**/yr.		# Individuals		# Individuals/yr.	
	Levee Sites	2011	Levee Sites	1999-2010	Levee Sites	2011	Levee Sites	1999-2010	Plantations	2011	Plantations	2005-2010	Plantations	2011	Plantations	2005-2010
Red-bellied woodpecker	32	48	29.2	38.9	5/1	2.5	5/1	2.5	5/1	2.5	5/1	2.7	21.0	2.7	2.7	2.7
Red-eyed vireo	31	51	38.1	69.4	13/3	12.5	13/3	12.5	22/4	21.0	22/4	21.0	21.0	21.0	21.0	21.0
Red-shouldered hawk	3	3	3.5	3.7	0	1.3	0	1.3	0	1.3	0	1.3	1.3	1.3	1.3	1.3
Ruby-throated hummingbird	1	1	1.3	1.4	0	0.2	0	0.2	0	0.2	0	0.2	0.2	0	0.2	0.2
Rufus-sided towhee	0	0	0.0	0.0	1	1.7	1	1.7	1	1.8	1	1.8	1.8	1	1.8	1.8
Scarlet tanager	5	6	4.0	4.3	0	0.8	0	0.8	0	1.0	0	1.0	1.0	0	1.0	1.0
Summer tanager	22	24	18.0	19.2	8/2	5.0	8/2	5.0	10/2	5.3	10/2	5.3	5.3	10/2	5.3	5.3
Swainson's warbler	12	17	7.6	9.4	1	0.8	1	0.8	1	0.8	1	0.8	0.8	1	0.8	0.8
Turkey vulture	1	1	0.7	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0.0
White-breasted nuthatch	13	17	12.2	15.7	0	1.5	0	1.5	0	2.0	0	2.0	2.0	0	2.0	2.0
White-eyed vireo	31	49	30.1	37.6	10/2	5.8	10/2	5.8	10/2	7.7	10/2	7.7	7.7	10/2	7.7	7.7
Wild turkey	1	1	1.2	1.3	2	0.2	2	0.2	2	0.2	2	0.2	0.2	2	0.2	0.2
Wood duck	3	3	1.1	1.1	0	0.2	0	0.2	0	0.2	0	0.2	0.2	0	0.2	0.2
Wood thrush	8	8	17.0	20.8	4/2	2.8	4/2	2.8	5/2	3.7	5/2	3.7	3.7	5/2	3.7	3.7
Yellow-billed cuckoo	19	21	11.4	13.6	10/1	4.5	10/1	4.5	11/1	5.7	11/1	5.7	5.7	11/1	5.7	5.7
Yellow-throated vireo	10	11	6.0	6.2	0/1	1.2	0/1	1.2	0/1	1.5	0/1	1.5	1.5	0/1	1.5	1.5
Yellow-throated warbler	1	1	0.4	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0.0
Prairie warbler					3	0.2	3	0.2	4	0.2	4	0.2	0.2	4	0.2	0.2
<b>TOTAL</b>	<b>40</b>	<b>923</b>	<b>43.3</b>	<b>948.2</b>	<b>18</b>	<b>15.0</b>	<b>18</b>	<b>15.0</b>	<b>363</b>	<b>272.3</b>	<b>363</b>	<b>272.3</b>	<b>272.3</b>	<b>363</b>	<b>272.3</b>	<b>272.3</b>

Roanoke River NWR Permanent Forest Plots - In 2005 WB Richter collected data on five 40 m X 200 m forest health plots located on the Company Swamp, Conine Island, and Broadneck Tracts of the Refuge. The plots are located in the part of the floodplain that is inundated when discharges from the dam at Roanoke Rapids are a continuous 18,500 cfs or greater for more than five days. It is at this discharge that prolonged flooding during the growing season (commonly mid- to late-spring) occurs and is believed to adversely affect the health of the forests being flooded. There are two types of information being collected from these plots: 1) Monitoring the health of the already established trees, and 2) Monitoring the regeneration and survivorship of tree seedlings. The goal of this study is to monitor the dynamics of the bottomland hardwood forest communities at elevations inundated at flows of 18,500 cfs and document any changes. The objectives of the study, overtime, are to: 1) monitor changes in forest structure horizontally and vertically; 2) monitor the effects of managed flows on forest productivity; i.e., species diversity and tree growth; and 3) monitor survivorship of woody seedlings and saplings over a minimum of five years. In order to connect any of the changes observed over the year to managed flows, reference plots in another similar river system with a run-of-river flow regime must be established. Finding a reference plot nearby has proven to be difficult due to differences in scale of the Roanoke River compared to other river systems. The Roanoke River is much larger and has a floodplain that is more intact than other nearby rivers. Instead of locating another watershed, a more appropriate reference may be comparing the seedling survivorship data observed over different hydrological gradients along the Roanoke River floodplain with that found in the Dominion Generation hardwood regeneration study.

The protocol used to establish these plots and collect data follows closely with that discussed in a paper published in *Castanea* 63(3): 262-274; by R. K. Peet, T. R. Wentworth, and P. S. White and is titled "**A flexible, multipurpose method for recording vegetation composition and structure.**" In order to track the health of the mature trees each tree was given an individual number and data on overall tree health; height, and diameter was collected when the plots were first established in 2000 and 2001. In 2004 and 2005 a special effort was made to collect data on the large trees from each plot in order to assess the damage the prolonged flood event of 2003 had on the trees. The results of this effort were described in the **2006 Annual Narrative**. Another attempt will be made to collect similar data in 2012. Data on tree health will be compared with previously collected data to look at overall changes in vegetation within and between plots and extrapolated to the surrounding bottomland forest community, where appropriate. Nested within each large 40 m x 200 m plot are twenty 1 m x 1 m seedling plots making a total of 100 on the floodplain. The seedling plots were established to monitor survivorship and productivity of different tree species. Data on ground cover, canopy cover, and presence of other species is recorded for each plot. This was the twelfth year data on all seedling plots (5 x 20 = 100 seedling plots) was collected.

Roanoke River NWR Rivercane Expansion Project – Giant rivercane (*Arundinaria gigantea*) communities are common in bottomland systems. Once dominant throughout the southeast, they have been reduced to fragmented populations covering less than 2% of their original range. In the southeast stands of giant rivercane are commonly found along stream banks. The Broadneck and Company Swamp Tracts support stands of giant rivercane on a portion of their levees. In some areas these stands are quite extensive and sparse to non-existent in other areas. Rivercane provides an important structural component to the forest ecosystem, when present it resides in the understory, along with shrubs, vines, and trees. It is key in providing the right habitat conditions for FWS priority species such as the Swainson's and Kentucky warblers. In the Refuge's Habitat Management Plan (HMP) an objective was developed to carry out management activities that would allow the existing stands of rivercane to expand. The objective, taken directly from the HMP, is:

#### Bottomland Hardwood Objective 2

In Management Units RB-Ash-2, 5; RB-swg-1; RB-syc-1; BN-nat-1, RB-nat-1 and CS-nat-1; in those areas where already established, promote the growth and expansion of river cane by reducing the BA to 40-60 ft<sup>2</sup>/acre in and around the river cane.

#### STRATEGIES:

- Thin using hack and squirt. Reduce the BA in and around established stands of river cane to 40-60 ft<sup>2</sup>/acre, by injecting trees with the herbicide Habitat during the dormant season.
- Avoid removal of any well-formed emergent trees or good wildlife trees; i.e., cavity trees, potential den trees.
- Before injecting hardwood trees remove any exotic invasive shrubs found in the units (i.e., Chinese privet, Mimosa, and China berry) by hacking the shrub and injecting it with an appropriate herbicide.

In order to implement the objective, WB Richter began scouting out areas on these tracts where stands of rivercane are currently present. Instead of injecting trees right away, a conservative approach is being taken to first monitor the movement of rivercane into areas where no cane exists. Three plots were established to monitor the growth of rivercane into adjacent areas where growth is sparse with special attention being put on basal area of the forest. Two plots were established on the Broadneck Swamp unit (one near Indian Creek and one upstream of Big Cypress) and a third on Company Swamp. Each plot consists of two subplots - one plot has a well-established stand of rivercane "prototype;" the other, the potential "treatment" plot, consists of an area where the rivercane is sparse. The plots will share a boundary. Each subplot is 30 x 30 meters. Basal areas and species stem counts were collected for each subplot. A meter tape was on the side of the plot common to both subplots. The "frontier" line and the location of the rivercane in the treatment plot was mapped out. An X, Y coordinate was setup with Y being the "frontier" line and X being the distance the rivercane is from the Y axis in the "treatment" plot. In two years the rivercane in the treatment plot will be remapped to determine how well the cane is colonizing the

area. A comparison of colonization rates in the three treatment plots will be done after two years. If colonization seems to be significantly low the three treatment plots the basal area will be reduced by injecting overstory trees. Monitoring will continue to note response. It is understood that there are most likely multiple factors that determine the rate of rivercane colonization into an area; however, light intensity seems to be the main driver behind rivercane growth.

### **Roanoke River NWR Reptile and Amphibian Surveys**

In spring of 2011 Refuge staff implemented a new Plantation Herpetofaunal Survey, continued the annual data collection on the existing 2005 Herpetofaunal Study plots (now called the "Floodplain Features Herpetofaunal Survey"), and on the first weekend in June coordinated a "Herp Blitz" on the Refuge. BT Railey wrote "A Protocol to Inventory and Monitor the Herpetofauna at Roanoke River NWR" to detail the methods used in setting up and collecting data for both the Floodplain Features Survey and the Plantation Herpetofaunal Survey.



**Narrowmouth toad**

Floodplain Features Herpetofaunal Survey (the 2005 Study) - A total of 51 plots were established in 2005 with each plot consisting of one 2' x 4' sheet of tin, one 2' x 4' sheet of plywood, and one 1½" pvc pipe. By 2007, the number of plots had been dropped to 49. Plots are concentrated on the Town Swamp, Broadneck, Rainbow, Company Swamp, and Conine Island tracts. The plots are located on various floodplain features including: levees - 20 plots; hummocks (high points, thought to be old dredge spoil piles, located on the levees) - 4 plots; high ridges - 8 plots; plantations (pine and hardwood) - 10 plots; and bottomland flats (Patuxent study plot on the Roanoke) - 7 plots. Results of the 2011 survey are shown in the Table below. From April - June, only 27 out of 49 plots were surveyed; in December 2011 six additional plots were checked with no species seen.

Table 3: RRNWR Floodplain Features Herpetofaunal Survey

SPECIES LATIN NAME	COMMON NAME	2005		2006	2007	2008	2009		2010		2011*
		MAY	OCT	MAY-JUN	MAY-JUN	MAY-JUN	MAY-JUL	OCT-NOV	JUN	OCT	APR-JUN
<b>AMPHIBIA</b>		<b>FROGS</b>									
<i>Gastrophryne carolinensis</i>	eastern narrowmouth toad										1
<i>Hyla cinerea</i>	green tree frog	4	4	7	3	3	1	4	3		1
<i>Hyla spp.</i>	unknown tree frog				1						
<i>Hyla squirella</i>	squirrel tree frog			2	2	1	2	2	1	6	3
<i>Hyla versicolor</i>	gray tree frog	3	2	2	8	3	2	2	2	3	3
<i>Scaphiopus holbrookii</i>	spade foot toad			1							
		<b>SALAMANDERS</b>									
<i>Ambystoma opacum</i>	marbled salamander	2			7	1		1	9	7	8
<i>Notophthalmus viridescens</i>	eastern newt								1		
<i>Plethodon chlorobryonis</i>	slimy salamander	3									
<i>Plethodon glutinosus</i>	slimy salamander	1									
<i>Plethodon spp.</i>	slimy salamander			2	10	3	6	1		2	14
<b>REPTILIA</b>		<b>LIZARDS</b>									
<i>Eumeces inexpectatus</i>	five-lined skink	1	1								
		<b>SNAKES</b>									
<i>Carphophis amoenus</i>	worm snake	2		1		1	2			2	3
<i>Lampropeltis getulus</i>	eastern king snake										1
<i>Thamnophis sirtalis</i>	eastern garter snake								1		
# SPECIES OBSERVED		6	3	6	6	5	5	5	6	5	8
% of Plots Surveyed		100%	27%	96%	100%	53%	59%	16%	100%	29%	55%
*Dec 2011 – 6 plots were surveyed; no species seen											

\*Dec 2011 - 6 plots were surveyed; no species seen

Plantation Herpetofauna Survey - This survey was implemented in late March 2011 at Town Swamp and Broadneck Tracts in three plantations: Sycamore, Pine, and Ash. The intention is for it to run for two years (2011-2012) to collect baseline inventory data in the different plantations. The ultimate goal at the plantations is to create more diverse wildlife habitat; future management strategies may include logging or hack and squirt methods. Each plantation study area includes drift fence transects with pitfalls and funnel traps, and artificial cover transects with both wood and tin coverboards and PVC pipes. Data collection was conducted for 10 consecutive days each month from April 2011 - October 2011. Twenty-nine different species were recorded; 13 reptile species and 16 amphibian species. A summary of the results are presented in the Table below.

Table 4: RRNWR - 2011 Plantation Herpetofaunal Survey

SPECIES	ASH	PINE	SYCAMORE	TOTAL by SPECIES
Black Racer	6	3		9
Black Rat Snake			1	1
Bullfrog	3		2	5
Eastern Box Turtle	1	3		4
Eastern Cottonmouth	1			1
Eastern Fence Lizard		2		2
Eastern Garter Snake	2			2
Eastern Narrowmouth Toad	6	70	78	154
Eastern Ribbon Snake	2	1		3
Eastern Spadefoot Toad		40	11	51
Eastern Worm Snake		10	11	21
Five-lined Skink	1	1	1	3
Gray Treefrog	6	1	1	8
Green Frog			1	1
Green Treefrog		1	1	2
Ground Skink	1	8	3	12
Marbled Salamander	2	52	66	120
Northern Brown Snake	1			1
Northern Cricket Frog			2	2



Redbelly Watersnake		1		1
Red-spotted Newt		30	5	35
<b>SPECIES</b>	<b>ASH</b>	<b>PINE</b>	<b>SYCAMORE</b>	<b>TOTAL by SPECIES</b>
Slimy Salamander		69	146	215
Southern Cricket Frog		4	2	6
Southern Leopard Frog	210	91	55	356
Southern Ringneck Snake		1	1	2
Southern Toad		4		4
Spring Peeper		1	3	4
Squirrel Treefrog	1	3	7	11
Upland Chorus Frog	3			3
<b>TOTAL OBSERVATIONS by PLANTATION</b>	<b>246</b>	<b>396</b>	<b>397</b>	<b>1039</b>
	<b>ASH</b>	<b>PINE</b>	<b>SYCAMORE</b>	
<b>TOTAL # of SPECIES by PLANTATION</b>	<b>15</b>	<b>21</b>	<b>19</b>	

RRNWR Herp Blitz - On 4 - 5 June the first ever 'Herp Blitz' was held on the Refuge. There were twelve participants that volunteered for the two-day event. All participants, qualified herpetologists, included: Jeff Beane, Curator of Herps. NC Museum of Natural Sciences; Jeff Hall, NCWRC State herpetologist; Ed Corey, NC State Parks Inventory Biologist; and other avid herpetologists. Participants were dropped off at different locations throughout the Refuge. Refuge tracts inventoried were Broadneck Swamp, Town Swamp, Company Swamp, Askew, and Conine. Participants worked in groups of 2 - 3 and were assigned to cover a general area on the Refuge. They were instructed to record a herp, observed or heard. GPS coordinates were taken and, if possible, a digital photo of the subject. Ed Corey compiled all the photos and recorded data and sent it to WB Richter. Results can be found in the Table below. Comments on the relatively low diversity and abundance arose. Conditions before and during the herp blitz were dry but it did rain the night of 4 June into the morning of 5 June which should have gotten things moving a bit. For the amount of area covered it is concerning that species diversity and abundance wasn't greater. Could we have just surveyed at the wrong time or does the altered flow regime on the Roanoke River have something to do with the results? Or is it just the fact that these secretive creatures are not easily found? More data is needed. Refuge Staff plan to do more Herp Blitzes in the future and will also continue monitoring efforts on the Refuge.

**Table 5. List of species encountered during the two day 2011 RRNWR Herp Blitz.**

Date	Species Latin	Species Common	Total
6/4/2011	Chelydra serpentina	Snapping turtle	1
6/4/2011	Elaphe obsoleta	Rat snake	1
6/4/2011	Eumeces fasciatus	Five-lined skink	1
6/4/2011	Notophthalmus viridescens	Eastern newt	1
6/4/2011	Pseudacris crucifer	Spring peeper	1
6/4/2011	Rana catesbeiana	American bullfrog	1
6/4/2011	Stereochilus marginatus	Many-lined salamander	1
6/4/2011	Coluber constrictor	Southern black racer	2
6/4/2011	Eumeces fasciatus	Five-lined skink	2

Date	Species Latin	Species Common	Total
6/4/2011	Gastrophryne carolinensis	Eastern narrow mouth toad	2
6/4/2011	Rana clamitans	Green frog	2
6/4/2011	Scincella lateralis	Ground skink	2
6/4/2011	Storeria dekayi	Brown snake	2
6/4/2011	Terrapene carolina	Box turtle	2
6/4/2011	Chrysemys picta	Painted turtle	3
6/4/2011	Plethodon chlorobryonis	Slimy salamander	3
6/4/2011	Agkistrodon piscivorus	Cottonmouth	4
6/4/2011	Hyla chrysoscelis	Cope's grey tree frog	4
6/4/2011	Nerodia erythrogaster	Red-bellied water snake	4
6/4/2011	Acris crepitans	Northern cricket frog	5
6/4/2011	Hyla squirella	Squirrel tree frog	5
6/4/2011	Trachemys scripta	Yellow-bellied slider	6
6/4/2011	Rana sphenocephala	Southern leopard frog	9
6/4/2011	Ambystoma opacum	Marbled salamander	11
6/5/2011	Agkistrodon piscivorus	Cottonmouth	1
6/5/2011	Anguilla rostrata	American eel	1
6/5/2011	Bufo terrestris	Southern toad	1
6/5/2011	Chrysemys picta	Painted turtle	1
6/5/2011	Eumeces fasciatus	Five-lined skink	1
6/5/2011	Hyla chrysoscelis	Cope's grey tree frog	1
6/5/2011	Kinosternon subrubrum	Eastern mud turtle	1
6/5/2011	Lampropeltis getula	King snake	1
6/5/2011	Nerodia fasciata	Banded water snake	1
6/5/2011	Opheodrys aestivus	Rough green snake	1
6/5/2011	Pseudacris crucifer	Spring peeper	1
6/5/2011	Rana catesbeiana	American bullfrog	1
6/5/2011	Rana clamitans	Green frog	1
6/5/2011	Scincella lateralis	Ground skink	1
6/5/2011	Sternotherus odoratus	Musk turtle	1
6/5/2011	Acris crepitans	Northern cricket frog	2
6/5/2011	Chelydra serpentina	Snapping turtle	2
6/5/2011	Nerodia erythrogaster	Red-bellied water snake	3
6/5/2011	Trachemys scripta	Yellow-bellied slider	4
6/5/2011	Ambystoma opacum	Marbled salamander	5
6/5/2011	Rana sphenocephala	Southern leopard frog	5

Askew Green Tree Reservoir Project – A map of the project area and summary of the results from the 2010 Emergent Vegetation Survey and Winter Waterfowl Survey is available in the **2010 Annual Narrative**. More detailed information can be found in the Biological Technician's Report "*Askew Tract – Water Management Project*."



A quick visual vegetation survey conducted in June 2011, prior to spraying for the invasive exotic dewflower, *Murdannia keisak*, showed a similar composition of plants as was found in the 2010 emergent vegetation survey. A systematic vegetation survey of emergent plants was not performed in the fall of 2011 due to the effects of the late August storm, Hurricane Irene, which resulted in high water levels leaving most emergent vegetation under water and much staff time spent on tree cleanup at the Refuge. Attempts will be made to survey vegetation in 2012. Wintering waterfowl surveys are being conducted from fall to spring each year. A summary of both vegetation and waterfowl surveys should be available in the **2012 Annual Narrative**.

Useful and accurate water level monitoring is still a goal we are working towards at the Askew impoundments. Currently there are 4 probes and several staff gauges on this tract; we intend to install more probes in early 2012. Analysis of existing data is underway and we hope to make useful correlations between the gauges, probe measurements, and other depth measurements within the impoundments. We are challenged by the influence of the constantly changing river levels and their impacts, but we intend to use sound science to be able to eventually predict our impoundment levels. In the meantime, we will continue to monitor and attempt control of the impoundments through the adjustment of the water control structures boards and flap gates, as needed.



**You never know what you will find when driving on the Refuge. This black rat snake took advantage of a warm gravel road on an early spring day.**



## *1b. Studies and Investigations*

Roanoke River NWR "Investigating Influences on Swainson's Warbler Nest Survival in a Bottomland Hardwood System Subjected to Asynchronous, Aseasonal Flooding" (04-42360-01) - The objectives of this study are to collect productivity and habitat utilization behavior data on the Swainson's warbler. To do this, Swainson's warbler nests were continuously monitored with infrared video cameras and adult birds were fitted with radio transmitters. If a significant managed flood event occurs during the field season it is hoped that a comparison of flood years to non-flood years could be made to determine if the altered flow regime impacts the foraging behavior and productivity of the species. Later on in the study, another study objective was developed to look at the occurrence of extra-pair paternity in the mating system of the Swainson's warbler. This is a phenomena being revealed with several different thought to be strictly monogamous passerines; the Swainson's warbler is thought to be one.

In 2005, Dr. Lancia, Professor of Wildlife Science, NCSU, recruited a PhD student, Neil Chartier, for this project. Mr. Chartier was awarded a special scholarship that covers tuition and provides a stipend for living expenses throughout the year. Mr. Chartier came from Eastern Michigan University where he received his MS degree. WB Richter has agreed to be a technical advisor on Mr. Chartier's graduate committee. The Refuge provided a vehicle and two boats, as needed. For a summary of the collaborators on this study and history of funding refer to the **2007 Annual Narrative**.

Last year was the fourth and final field season of this study; a final report in dissertation form is due in 2011. Mr. Chartier has taken a position with USFWS Division of Migratory Birds in Region 3. As a result, he did not meet his goal of completing his dissertation. It is expected that it will be received next year. When it arrives it will be placed in the Refuge file system under *Research and Special Studies*. This closes out this study on the Refuge.

Roanoke River NWR "The Dynamics of Woody Debris on the Coastal Plain Reach of the Roanoke River, North Carolina, and its implications for Aquatic Resources" (07-42360-01) - The principle investigator for this study is Dr. Cliff Hupp, USGS, Reston, VA. The subject expert is Dr. Bertrand Moulin, who resides in France, and collaborators are WB Richter and Mr. Ed Schenk, USGS, Reston, VA. Dr. Moulin has studied the dynamics of large woody debris on coastal rivers in France and has agreed to bring his expertise on woody debris to the Roanoke River. The study will look at how different flow regimes (flood control or hydropower peaking) effect the movement and generation of large woody debris (LWD) in the coastal plain reach of the River. In 2006 WB Richter and Dr. Hupp submitted a Science Support Partnership funding proposal to compete for USGS funds. In 2007 the project was funded for four years receiving an average of \$22,500 per year.

The objectives of the study include the determination of:

- The spatial distribution within the channel of forms and volumes of LWD accumulation.
- The characteristics of LWD in transit and its temporal and geographical origin.
- The residence time of LWD in the River.
- The main transport mechanisms of LWD; i.e., hydropower peaking and/or flood control operations or none of the above.
- The development of a LWD budget and the prediction of the future of LWD budgets based on various management scenarios through modelling.

The goal of this work is to better understand spatial and temporal dynamics of LWD in large coastal plain rivers, specifically the Roanoke River from downstream of the dams to the Albemarle Sound (137 miles) in northeastern North Carolina. The first step involved reviewing the video footage of woody debris obtained through the USACOE 216 Study and determine the spatial distribution, volume, and forms of woody debris within the channel. With an idea of distribution and types of LWD, pieces will be tagged with tracking devices. Locations of the woody debris will be checked periodically and movement will be correlated to flow releases.

The second part of this project is to develop a LWD budget for the aquatic ecosystem. Volumes of LWD that are already present and/or potential in the River will be quantified. This will be based on rates of bank erosion Hupp et. al. determined in the Schenk et. al. 2009 study described in previous Narratives, and the volume of trees on the levee, and the geomorphic feature most susceptible to erosion. Based on the information and the current hydrologic regime, a predictive model of LWD will be constructed. The model will estimate the production, storage, and sources of LWD in the River based on dam releases. It is anticipated that the results of the proposed study will have broad application throughout the Atlantic and Gulf Coastal Plain. The project was completed in December 2011 with opportunistic follow up.

This year, Ed Schenk visited the river in the spring to download results from the fixed reader in Williamston, NC and do an integrated bathymetry and mobile radio tag reader data cruise. The large woody debris results from 2011 were compared with previous results and presented at the 2011 American Geophysical Union (AGU) conference in San Francisco. The abstract from the presentation follows:

**Large wood transport dynamics on the low-gradient Roanoke River, North Carolina**

\*Schenk, E R, [eschenk@usgs.gov](mailto:eschenk@usgs.gov); \*Hupp, C R, [crhupp@usgs.gov](mailto:crhupp@usgs.gov)

\*National Research Program, United States Geological Survey, Reston, VA, USA

Abstract: "Large wood (LW) provides essential aquatic habitat in fine-grained low-gradient rivers. Unfortunately, there are relatively few studies on the sources and transport dynamics of large wood in Eastern U.S. Rivers. The purposes of our study

are to determine LW abundance and transport processes for the 210 kilometer (km) Coastal Plain segment of the dam-regulated Roanoke River, North Carolina. Our methods included collecting background geomorphic data including a 200 km channel geometry survey and measurements from 701 bank erosion pins at 36 cross-sections over 132 km. LW concentrations were evaluated over a 177 km reach using geo-referenced aerial video taken in March 2007. LW transport was measured using 290 radio tagged LW pieces (mean diameter = 35.0 cm, length = 9.3 m) installed between 2008 and 2010. An additional 54 floating pieces were tagged with aluminum tree tags for a one week flood study in November 2009 (mean diameter = 29.2 cm, length = 5.2 m). The longitudinal distribution of aerially surveyed individual pieces of LW was highly variable with a mean abundance of 55 pieces/km. The abundance of LW in logjams was 59 pieces/km, with logjams concentrated (21.5 logjams/km) in an actively eroding reach with relatively high sinuosity, high local LW production rates, and narrow channel widths. Most jams (70%) are available nearly year round as aquatic habitat, positioned either on the lower bank or submerged at low-water flows. Conversely, individual LW pieces are found on the upper bank, with only 18% of the population located in the channel during low-water flows. Repeat surveys of radio tagged LW determined that transport is common despite dam regulation and a low channel gradient (0.0016). The mean distance travelled by a radio tagged piece of LW was 11.9 km with a maximum of 101 km (84 tags moved, 96 stationary, 110 not found). The mean distance travelled by an aluminum tagged LW was 13.3 km with a maximum of 72.12 km during the one week flood study (52 LW in transport at the time of tagging). Nearly half (46%) of the aluminum tagged LW stopped moving within one week, all within logjams. These flood period logjams are often short lived with LW breaking away as rafts to form new logjams downstream. Longer term transported radio tagged LW was found at low flow in either logjams (44%), as individual LW (43%), or submerged mid-channel (14%). LW plays an active role as a geomorphic agent on the river, creating sand bars behind and within large logjams, buttressing banks as standing snags, eroding banks as top heavy agents of mass wasting, and creating hydrologic dams at levee crevasses. Further research may determine the exact effects of LW on macroinvertebrate and fish populations.”

Overall, the radio tagging study provided unprecedented detail on large woody debris transport dynamics on the East Coast. Nearly half of the tagged wood moved during the three year study with many pieces moving in excess of 50 river km. The investigators plan on writing a scientific article in 2012 presenting the results.

Roanoke River NWR “The Effects of Artificial Canopy Gap Creation on the Growth and Development of Bald Cypress Advanced Regeneration on the Lower Roanoke River Floodplain, NE NC” (08-42360-01) – The overarching goal of this project is to determine the feasibility of restoring bald cypress into canopy-level dominance in specific areas by significantly increasing available light to already-established bald cypress saplings via the creation of artificial gaps in the canopy. Though some research has been conducted on the effects of increased light and decreased competition via thinning on residual adult bald cypress growth as well as the effects of varying light levels on young seedling

growth, essentially no work has been done on the effects of increased light (release) on understory bald cypress saplings, especially when potentially stunted for long periods of time. These artificial canopy gaps would be created by killing overstory water tupelo trees (by girdling and herbicide injection) directly overtopping saplings within a local area. If the initial (first two growing seasons) growth response of bald cypress saplings is significantly positive, and continued yearly monitoring shows continued growth of at least a moderate pace, the herbicide treatment conducted on experimental plots (and possibly other areas of the Broadneck tract) may be more widely applied throughout the Refuge where current bald cypress advanced regeneration exists.

A secondary project goal is a clearer understanding of the dates of past logging operations and a more thorough understanding of how past logging operations and continuous dam flow management regimes have affected the forest's development and individual tree growth.

This study primarily intends to examine the growth-response of bald cypress saplings to canopy gap creation. However, as mentioned above, there are several secondary avenues of research. All specific objectives of this study are listed below:

- To determine the rate of initial (first and second growing season) growth response of bald cypress advanced regeneration to significantly increased light conditions from artificial canopy gap creation. Growth and mortality response will be evaluated across sapling size and density gradients, as well as in reaction to initial overstory composition.
- To determine, using dendrochronological techniques, ages and past rates of growth of adult, overstory water tupelo in response to various environmental conditions and large scale alterations to local hydrologic regime (i.e., dam building). If adequate hydrologic data is available, hydrologic conditions at the time of establishment for the present canopy trees will be evaluated.
- To determine, using dendrochronological techniques, ages and past rates of growth of adult, canopy bald cypress trees in an effort to determine an estimate of the general number and ages of cohorts on the floodplain and to similarly examine the species' response to local hydrologic regime (if adequate hydrologic data is available) and dam building.
- To monitor/examine current growth rates of bald cypress saplings in naturally existing gaps of various sizes.
- To utilize the above information in an effort to determine the feasibility of restoration of bald cypress into the forest canopy over significant acreage via release of existing advanced regeneration (of various sizes and densities) through artificial canopy gap creation.
- To utilize the above information in an effort to generally contribute to the overall knowledge concerning the effects of dam flow management on floodplain ecosystems.

## METHODOLOGY

Basic Design – In order to clearly understand the effects of increased light on bald cypress sapling community growth and development, both treatment and control plots are necessary. These plots should capture the existing range of variation in terms of sapling size and density. A paired plot sampling design has been chosen, with each pair to contain a treatment plot in which all non-bald cypress woody vegetation will be girdled and injected with a herbicide and a control plot in which no treatment will be conducted. The herbicide *Habitat* has been chosen as it has proven effective for killing large water tupelo trees in past studies. In order to create gaps in the canopy large enough to provide significantly increased light (full sunlight for many hours each day) and to prevent canopy re-closure, plots are to be 19 x 24 m in size. All non-bald cypress woody vegetation 1.37 m tall or larger rooted in treatment plots will be killed, as will all non-bald cypress woody vegetation outside the plots which shades any portion of the plots from direct overhead light. Initially, treatment and control plots will be generally paired based on relatively close location (i.e., similar hydrology – no plots further than 0.4 km apart, most 60 - 100 m apart) and similar bald cypress sapling density and size characteristics. Any individual treatment and control plots will be kept at least 40 m apart to avoid edge effects on the control plots from artificially created canopy gaps in treatment plots. Fourteen pairs of plots have now been established. Target tupelo trees were treated in November of 2008.

A final report has been received from Dr. William Conner at Clemson University. This closes out this project from annual reporting in the Narratives. All annual reports along with the final report and graduate student Will deGravelles Master's thesis can be found in the Refuge file system in the "*Research and Special Studies Section*". Some noteworthy points from the final report are bulleted below:

- The mean three-year total for treatment saplings was  $1.81 \pm 1.66$  cm while the mean three-year total for control saplings was  $0.14 \pm .25$  cm. This difference is statistically significant.
- Bald cypress sapling mortality in treatment plots was 5.0% and in control plots mean mortality was 13.7% indicating that if the saplings remain light suppressed many of them will die.
- Larger saplings respond to being released better than smaller.
- There is a slight lag time between release and a decrease in high mortality levels for long-suppressed bald cypress saplings.
- Tree ring analysis indicated that the earliest record for the mature canopy tupelo ranged from 1835-1938, with most (6) dating back to the 1860's and 70's and likely having established not long before that.
- Canopy bald cypress show greater growth rates in most years than water tupelo - which is typical and known from many previous studies of the two species growing together as adults.
- The total number of flooded growing season days is correlated positively with bald cypress growth, but only weakly and in a conflicting manner for water tupelo.

# 2

## *Habitat Restoration*

### *2a. Wetland restoration: On-Refuge*

In 2004, Refuge staff partnered with Ducks Unlimited (DU), The Nature Conservancy (TNC), and NCWRC in putting together a package of wetland restoration, enhancement, and acquisition projects throughout the Roanoke River Basin. The package, totaling just under one million dollars, was submitted to the North American Wetlands Conservation Council to compete for North American Wetlands Conservation Act funds. WB Richter proposed two projects for the Refuge. The first is geared towards enhancing approximately 500 acres of cypress/tupelo swamp habitat. The basal area of water tupelo will be reduced in areas where tupelo is the dominant species in an effort to open up the canopy. The second project submitted was to restore the hydrology on approximately 1,100 acres on the Refuge's Rainbow Unit. Three man-made canals are proposed to be plugged. Two are located on the River proper (BN1 and BN2) just upstream of Black Gut. The third canal is located in from the River off from Black Gut that extends into the swamp along an old logging road that runs east-west. There was a design flaw in the original plug design – the wing-walls were not high enough or long enough to keep the River out during prolonged high flow events and in addition water overtopped the third plug off from Black Gut. To correct the problem it was decided the wing-walls needed to be raised and extended approximately 15 feet to tie them into the levee and the height needed to be raised two feet. In addition an earthen berm would need to be constructed at the site of the third plug to prevent water overtopping the plug. DU facilitated the modifications to the wing-walls/height and the Refuge created the berms. The project is still experiencing problems and Refuge staff is monitoring to determine what corrections, if any, can be made. For more details on these projects refer to previous Refuge Annual Narrative reports.

Refuge Staff continue to monitor water levels in the backswamp so a comparison of pre- and post- project hydrology conditions can be made. A final report was received from Clemson University that looked at creating light gaps to restore the cypress component back to the swamp forest. Refuge Staff need to initiate a monitoring program to look at the response of aquatic emergent plants to the creation of the light gaps.

### *2b. Upland restoration: On Refuge*

Nothing to report.

*2c. Wetland Restoration: Off-Refuge*

Nothing to report.

*2d. Upland Restoration: Off-Refuge*

Nothing to report.



# 3

## *Habitat Management*

### *3a. Manage Water Levels*

Managing water levels means something different at the Roanoke River National Wildlife Refuge. Water is the driving force in a bottomland hardwood forest ecosystem. Over the years water has carved the floodplain and dictated where and what plant and wildlife species are found in the bottomland system. The dams located upstream of Refuge lands manage the water levels downstream in ways that do not mimic what would happen naturally. It is impossible to manage water levels on Refuge lands when water enters from different points along the River. In reviewing the annual hydrograph, this year was relatively dry with the total rainfall amount being slightly below the 30-year average. Releases from Roanoke Rapids were increased to provide attractant flows for anadromous fish runs. The dry summer gave little opportunity for DG to peak out of Roanoke Rapids. Hurricane Irene dropped 10+ inches of rain in the area flushing the backswamps and causing a fish kill on the river. The majority of the rainfall occurred below Roanoke Rapids Dam so flood control was not a factor in the fish kill. Later in the year rainfall amounts increased; that increase, accompanied with a significant reduction in evapotranspiration water, was able to accumulate in the low areas on the floodplain. The USACOE went into flood control mode for three days which was not long enough to cause any significant flooding downstream. See Hydrograph at the beginning of this Narrative.

### *3b. Manage Moist Soil Units*

Askew Impoundment Project – For background information on this project refer to the **2007 Annual Narrative**. The purpose of this project was to impound water in forested areas during the dormant season in order to provide habitat for migrating and wintering waterfowl. During periods of extreme drought water can be pumped into the northwest side of the project via a well to provide waterfowl access to habitat they would otherwise not have access to. After four years with the project in place the Refuge staff is finding that the project is proving to be difficult to manage and is not meeting all of its intended objectives. One of the challenges is that the project is tied directly to the hydrology of the River. Any flows equal, or greater than, 12,000 cfs will cause water to enter the southeast impoundment via low points along Conine Creek; this is of greatest concern when flows of 12,000 cfs or greater occur during the growing season. When the SE impoundment was constructed, only one culvert was placed to drain the impoundment. It proved to be undersized and was not able to drain the water in a timely manner since it could only remain open during work hours when beavers are less likely to stop up the culverts. A



result of having only one small culvert is that several acres of hardwoods may remain flooded in the impoundment during the growing season. A Clemson beaver deceiver device was installed this year which will allow water to constantly drain through the culvert 24/7 until water levels reach the desired elevation in the impoundment. Other concerns include the seepage of water into the north impoundment. When the river stage at Williamston reaches 10 feet above msl, river flows will begin to influence the water stage in the north impoundment (area north side of the logging road) in two ways: 1) By coming in through the canals and around the end of the logging road, and if river flows are held at 20K cfs for more than five days the river will overtop the levee and flow directly into the north impoundment; and 2) through hydrostatic pressure water will move through the soil from the river and seep into the impoundment. The concern is that one of the main objectives of the project was to prevent prolonged growing season floods, but the result is that the area becomes inundated during the growing season when the USACOE goes into flood control for more than five days.

This project continues to be challenging. The general consensus is that with the money and effort already invested into this project, we should make a valid attempt at managing it before we decide it is unmanageable.

BT Railey has forged on with the implementation of suggestions in the Askew Green Tree Reservoir Management Plan. Vegetation and waterfowl surveys have been conducted, as well as monthly water level probe downloads, and an Annual Report on the project will soon be available. Although the Askew Unit is not a "perfect" example of a working moist soil unit, current efforts to manage the water levels are showing that, with much effort, some control can be exercised over some of the impoundments. It will be interesting to see what impacts the beaver deceiver has. It is hoped that active water level management, monitoring, and surveys will continue on a regular basis in future years so that we may get a more clear picture of how the river flows are affecting the emergent vegetation and waterfowl use of it.

### *3c. Graze/Mow/Hay*

Roads on Broadneck, Company Swamp, Conine and Askew were mowed in late summer, the Kuralt Trail parking area was mowed in late spring and late summer.

### *3d. Forest Cutting*

Nothing to report.

### *3e. Control Pest Plants*

Treating invasive plants was identified as one of the Refuge's Top Three Critical Needs during the Nov.15 - 17, 2010 "Pulse Check." It was recommended that an Americorps strike team be employed to handle the Mimosa, Chinese privet (*Ligustrum sinense*), and any other exotics we may need to aggressively control.

### **Mimosa**

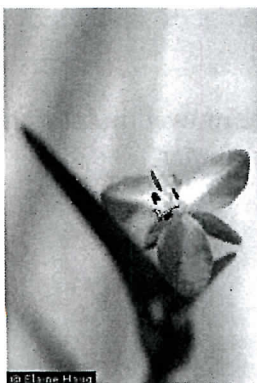
While checking survivorship, WB Richter observed Mimosa (*Albizia julibrissin*) shrubs had become established in the forest restoration plot located along Town Swamp Main Road closest to Rascoe's Ridge. Upon further investigation it appears the Mimosa has become well established in the young pine plantation bordering the plot, hence the source of the Mimosa in the forest restoration plot. In 2010, EO Wilkins, BT Railey, and Summer Intern Leeb began the arduous task of trying to control the Mimosa, employing a hack and squirt method with the herbicide "Habitat." Due to staff time constraints, no follow-up was carried out this year, but in the future Refuge staff will attempt to follow-up and continue control measures.

### **Chinese Privet**

WB Richter has also observed pockets of Chinese privet in the mixed hardwood plantation on the Rainbow unit while conducting point counts in this area.

### **Marsh Dewflower**

Refuge Staff spent two days in late July 2011 spraying the abundant marsh dewflower in the northwest impoundment on the Askew. Control efforts were not definitive. It seemed that Element 3A (a generic of Garlon 3A) set the plant back but didn't kill it although it killed all other herbaceous species in its way. Since marsh dewflower reproduces most often by seed, Refuge staff thought that setting the plant back enough so it doesn't flower would be one step in the right direction for controlling the plant; however, the species is so widespread in the impoundment that the spraying effort most likely had little effect. There will be a follow-up next year and a determination will be made as to what is the best management strategy.



# 4

## *Fish and Wildlife Management*

### *4a. Bird Banding*

The Refuge had a pre-season banding quota of 125 wood ducks. This year, no attempts were made to band. Lack of rainfall this year resulted in insufficient water present at the banding site this year. Due to other higher priority projects that were underway at the time, Refuge management did not see it as a priority to find other sites on the Refuge.

### *4b. Disease monitoring and treatment*

Nothing to report.

### *4c. Re-introductions*

Nothing to report.

### *4d. Provide nest structures*

Nothing to report.

### *4e. Predator and exotic control*

Fire ants have been becoming more prevalent along the Askew East and West road, portions of the Town Swamp Main Road, and along the Company Swamp right-of-way in past years; however, this year there was not a lot of fire ant activity observed. Refuge staff will continue to be vigilant about treating these mounds in the future in an effort to control the spread of the ants.



# 5

## *Coordination Activities*

### *5a(1). Interagency coordination*

USACOE 216 Study – For background on the USACOE Section 216 Study and for a review of the progress that has been made on the study in previous years refer to the **Annual Narratives** from 2001-2010.

The following progress has been made this year on the study that is now due to be completed in 2015:

- USACOE has agreed to fund part of the study being carried out by VA Tech Professor, Dr. Diplas, looking at the effects of hydropower peaking on bank stability. This study will also look at what types of flow regimes, in addition to peaking, cause the banks to collapse. The results of the VT study are outlined and discussed below under Dominion Generation Relicensing Studies. The VA Tech study is restricted to the reach of the river in the vicinity of Scotland Neck. It does not look at the entire reach of the river, especially that reach which is experiencing the most erosion (HWY 11/42 to Williamston). Refuge staff and other downstream conservation partners must be on alert with how the USACOE uses the results of the VA Tech study to interpret the impacts of their flood control operations on bank stability.
- Ana Marie Garcia, USGS, Raleigh, and her colleagues have taken over Dr. Jerad Bales, USGS, duties (Dr. Bales relocated to Reston, VA, as Chief of Water Resources) in developing a water quality model that can be used to assess the effects of changes in John H. Kerr operations on DO levels in the river and floodplain from the base of the Roanoke Rapids Dam downstream to the mouth of the river. The USGS study will utilize a 3-dimensional hydrodynamic model that will be linked to a 3-dimensional in-stream water quality model (WASP). Once these modeling tools are created they will be used to simulate eight different water quality management scenarios that have been proposed by the Water Quality workgroup. The results of these efforts may lead to additional measures regarding changes in operations at the reservoir, as well as providing information that could be used to evaluate the effects of measures on habitat in the downstream floodplain. The model has been completed and the following flow scenarios have been run through the model: First to establish a baseline of water quality parameters, scenarios of 11K cfs or less to assess the effect of point source pollution so these effects could be teased out of floodplain contribution and minimum flow releases from Roanoke Rapids Dam were run. After the baseline

was established, the following scenarios were simulated in the model, alternative 6b and hydropower peaking operations out of Roanoke Rapids. The model produced output for water quality values for three sites: Oak City, Williamston, and Jamesville. Water quality at the Oak City site has minimal influence from floodplain drainage; the Williamston site is substantially affected by drainage of upstream floodplains; the Jamesville site is affected by floodplain drainage and is also influenced by backwater from the Albemarle Sound. Some preliminary results of outputs from the model are: the greatest effect of the 6b alternative on DO relative to existing conditions was observed at Williamston. Mean DO concentrations at Williamston increased by 12% from existing conditions. Under existing operations DO <5mg/l occurred 84 percent of the time during the April-August simulation period, compared to 72 percent of the time under alternative 6b, there were about 5 more days per month for which instantaneous DO was greater than 4 mg/l relative to existing conditions. The hydropower peaking scenario produced the following preliminary results: At the Oak City assessment location, nearest to the dam, maximum dissolved oxygen concentrations increased by 11 percent and the minimum decreased by 16 percent, while the mean concentrations remained unchanged. At Williamston, exceedances to the daily 5 mg/l standard decrease under peaking operation by 37 percent, but the minimum predicted concentration lowered the most downstream assessment location, Jamesville, decreases substantially by 23 percent from 3.6 mg/l to 2.7 mg/l. The hydropower peaking operations have the effect of broadening the range of dissolved oxygen concentrations in comparison to operations under the FERC minimum flows. As noted these results are preliminary. The model is going through a formal peer review process within the USGS. Once the model is finalized, it will be handed over to the USACOE where they will be able to run additional scenarios to answer questions such as, whether the betterment plan improves water quality etc.

- A new twist of events developed for the downstream riparian team. To everyone's surprise, the USACOE began an environmental benefits analysis of the downstream floodplain ecosystem. What this entails is assessing baseline conditions; i.e., forest health, species composition, and distribution of the floodplain forest that is affected by the USACOE's flood control operations. To do this the USACOE proposed using a hydrogeomorphic (HGM) model. The HGM model was developed by collecting data on species distribution relative to hydrology, stream type, and gradient on which a plant community can be found from river systems throughout the southeast. Similar data collected from the Roanoke River floodplain would be plugged into the model and compared on a regional basis. The big concern about this approach is that it is very qualitative, and it isn't able to quantify ecosystem functions. One other concern was that many of the reference points used to construct the model came from the Roanoke River. These types of concerns prompted the downstream riparian team to discard the HGM approach. Instead the group worked with Dr. Tim Wilder with the USACOE's Engineer Research and Development Center out of Vicksburg, Mississippi, to derive a model that would somehow characterize the floodplain

forest. The group hesitantly went ahead with a paired watershed approach (Tar River) and compared data from the Roanoke River to another southeastern river. Data was collected on forest species composition relative to hydrologic location on the floodplain and data on tree health, location of species in the vertical structure, etc. The data collected from the Roanoke River floodplain was assessed by comparing the current condition of the floodplain ecology to reference data. The reference data would be that of the Tar River floodplain. Although there were serious concerns about using the Tar River, a nearby unregulated river, as a reference for the Roanoke mainly due to scale (the Tar River floodplain is much smaller than the Roanoke) it was all we had. Data collected from the Roanoke River was also compared with US Forest Service's Forest Inventory and Analysis Database. It was critical that the USACOE had a good baseline so they can assess the impact of the current operations of their flood control project as well as assess the effects of proposed release alternatives on downstream forest health and wetland functions. In the USACOE's cost/benefit analysis, in order to justify changes to how they currently operate their flood control project they need to be able to quantify with and without change an effect on the downstream system. For example, they would be looking at the following: Over the next 50 years, if nothing is done, the project area will provide 10,000 average annual habitat units. Or, over the next 50 years, with Alternative X in place, the project area will provide 15,000 habitat units. Therefore the benefit of Alternative X over the 50-year period is 5,000 habitat units. Does this justify a change? This would be weighed against impacts to hydropower production, recreation, etc. A draft report entitled: "Review of Impacts to the Lower Roanoke River Basin Floodplain Due to Flow Regulation at John H. Kerr Reservoir" was released in January 2011. The Executive Summary follows:

*The operation of the John H. Kerr reservoir is under review by the Wilmington District Corps of Engineers, as authorized by Section 216 of the River and Harbor and Flood Control Act. ERDC-EL reviewed the proposed changes to the operations of the John H. Kerr reservoir releases know as option 6b. The main focus was to assess the potential for environmental benefits to the lower Roanoke River floodplain ecology from the implementation of option 6b.*

*Hydrologic parameters were compared between three scenarios; current operations (no-action alternative), option 6b, and an unregulated (natural) hydrologic regime. The no-action alternative and option 6b were found to vary significantly from an unregulated hydrological regime. Generally, natural flows would tend to be higher in stage in the winter and early spring and much lower in the stage for longer periods late in the growing season, allowing the floodplain to dewater. Variations between the no-action alternative and option 6b were found to be very minor, and of no ecologic significance.*

*The current condition of the floodplain ecology was also assessed by comparing vegetation data from the Roanoke River floodplain to reference data from within the ecoregion in two approaches. In the first approach, data was collected by ERDC-EL in October 2010 from floodplain sites on the Roanoke River and the Tar River, an unregulated river adjacent to and south of the Roanoke River watershed. In the second approach, data from the Roanoke and other river floodplains in North and South Carolina was obtained from the US Forest Service's Forest Inventory and Analysis Database and compared. Both approaches support the conclusion that the vegetation of the lower Roanoke River floodplain is under stress from prolonged inundation.*

*In summary, option 6b and the no-action alternative are similar in the aspects that are most important to floodplain ecology, and in that the current trend of degradation in the floodplain vegetation will continue at a similar rate under either scenario.*

Note: For an explanation of alternative 6b and how it is defined refer to either the 2008, 2009, or 2010 **Annual Narratives**.

This report is of great significance to those with conservation interests downstream of Roanoke Rapids. The USACOE has actually admitted that their operations are degrading the downstream ecosystem, this includes Refuge lands. We are hoping after the USACOE's internal review that the executive summary will read the same.

- One of the task groups in the Section 216 Study is the Hydropower Analysis task group. John Ellis, Raleigh, FO, is the FWS representative on this group. This group consists of stakeholders with hydropower interests as well as conservation interests. Now that there is agreement among stakeholders participating in the 216 Study as to which alternatives should be analyzed the Hydropower Analysis group is tasked with reviewing the economic impact the different alternatives would have on hydropower production. A preliminary report titled: *Hydropower Impacts of Changes in Water Control Operations* (Draft) has been distributed for review by the task group. The Table below shows the project energy benefits (economic impact) to power production at the USACOE's and DG's Gaston and Roanoke Rapids projects for the different alternatives being evaluated.

**Table 6 Project Energy Benefits (x\$1,000) at Kerr, Gaston and Roanoke Rapids projects under the 3 alternative flow scenarios, MGC\_35k, Plan QRR (quasi run of river), and MGC\_35k\_yr\_rnd.different alternatives.**

Project	Baseline	MGC_35k	Plan QRR	MGC_35k_yr_rnd
John H Kerr	\$29,703	\$28,115	\$27,418	\$27,923
Gaston	\$20,714	\$20,653	\$20,671	\$20,833
Roanoke Rapids	\$20,819	\$20,354	\$19,698	\$19,863
<b>Total</b>	<b>\$71,236</b>	<b>\$69,122</b>	<b>\$67,787</b>	<b>\$68,619</b>



The average annual net hydropower benefit is the sum of the energy net benefit and capacity net benefit of the two flow scenarios. The hydropower net benefits are summarized in the Table below. Each of the scenarios results in a loss of net hydropower benefits.

**Table 7. Total Hydropower Benefits for Roanoke River Lower Basin Hydropower System**

SCENARIOS	Capacity Net Benefit (x\$1,000)	Energy Net Benefit (x\$1,000)	Total Hydropower Net Benefits (x\$1,000)
Baseline	---	---	---
MGC_35k	\$50	(\$2,114)	(\$2,064)
Plan QRR	\$38	(\$3,449)	(\$3,411)
MGC_35k_yr_rnd	\$79	(\$2,617)	(\$2,538)

The conservation stakeholders met at the FWS Raleigh FO on 22 November to discuss the draft report for accuracy. Since none of us have the expertise to know whether a fair analysis was carried out it was difficult for us to come to any conclusions. The USACOE requested that the report not be disseminated outside of the arena of the Section 216. As it stands, it does not seem that hydropower production will take a significant loss in the different alternatives evaluated. When permissible, we will seek out the expertise to have the report critiqued. A preliminary review by internal conservation stakeholders Jim Mead, NCDENR, Water Resources; Brian McCrodden and Steve Nebiker of Hydrologics; and Chuck Peoples, TNC, concluded that on the surface the report appeared plausible but with a few questions regarding the pricing file which is proprietary to the industry.

The USACOE, Wilmington Office, continues to hold informative conference calls every Tuesday to involve stakeholders in any water management related issues in those river basins where the USACOE has flood control or water supply projects. When time permits, and flow issues are apparent, WB Richter will call in to voice concerns regarding Refuge resources.

Dominion Generation Relicensing Studies - See previous Annual Narratives for a history of relicensing efforts and progress. A 40-year license was issued to DG in early 2005. DG continued to follow its responsibilities under their new license agreement. For example, there is now 325 cfs of water flowing through the bypass reach. WB Richter is a member of the Cooperative Management Teams (CMTs) that will discuss the FL4 Article 415) - downstream ecological impacts of within-week peaking, FL3 (Article 414) - downstream ecological impacts of within-day peaking, and FL7-downstream water quality.



The FL4-downstream ecological impacts of within-week peaking team, FL3-downstream ecological impacts of within-day peaking CMTs met on 14 March, 28 June, and 11 October this year to discuss progress being made on the studies being carried out under the respective articles. This year is particularly crucial for the CMT as this concludes the first 5 years of studies. Under DG's license agreement, the CMT is tasked with reviewing the results of the studies (macro invertebrate, seedling survival, bank stability, distribution of fish) that have occurred the past 5 years. The CMT has to examine the results of the studies mentioned above to determine if DG's operations show up in the results as causing adverse effects to the subject studied. For example, if the hardwood regeneration study was indicating that seedling survivorship seemed to decrease in those years where DG peaked a lot during the growing season, determination has to be as to whether it was DG's peaking operations that caused this or other factors. If it was DG's operations then the CMT must develop changes in operations that will lessen the impact.

The following is an update on the studies sponsored by the CMT that were designed to determine whether DG's operations have impacts downstream of their projects:

Effects of Hydropower Peaking on Bank Stability: Dr. Panos Diplas, VA Tech University, was awarded a contract to determine the impacts DG's hydropower peaking has on bank stability. This study was further enhanced through financial support by the USACOE to look at the impacts flood control operations have on bank stability. For details on this study refer to previous **Annual Narratives**. In addition to the work already proposed, the CMT agreed to fund additional work that would assist the researchers at VT in answering some questions that would enable them to produce a more robust study. Specifically, the additional work will address three items: First, previously discussed with the John H. Kerr 216 Study Work Group 3, would be to provide an opinion on the effects of 35,000 cfs releases on bank retreat relative to the effects of 20,000 cfs releases. Second, to assess the effects of stepped-down discharges from maximum flood releases per the Roanoke River Betterment Plan, and provide recommendations for feasible alternatives less likely to contribute to bank retreat. The analysis should include a step-down scheme that would minimize bank retreat. And third, to characterize soils permeability along the VT study reach, based on VT samples and possibly USGS samples.

The final report was delivered to both the CMT and the USACOE on 22 December 2010. A summary of findings and a review of the FWS's response to the report can be found in the **2010 Annual Narrative**.

Hardwood Regeneration: Dr. Robert Peet, UNC-Chapel Hill, is the Principle Investigator for this study. Under the guidance of Dr. Peet, Doctoral student Jackie White was recruited to carry out the hardwood regeneration study DG is required to do as part of their settlement agreement. Ms. White completed her third field season this year. Refer to previous Annual Narratives for background information on design. The goal of this study is to assess the impact of Roanoke Rapids Dam operations, specifically peaking

operations, on the establishment and survivorship of tree seedlings on the downstream bottomland hardwood forest system.

From 2007 - 2011, data was recorded on 118 seedling plots. The plots, located between Weldon and Devil's Gut span an array of hydrological gradients on the floodplain that are impacted by DG's flow releases as well as the USACOE's releases. Thirty-nine plots are located in the zone of inundation when flow releases are between 5,000 - 14,000 cfs for five or more days; this is the zone that DG is thought to have an impact on during their peaking operations. Fifty-four plots are located in the 15,000 - 20,000 cfs zone of inundation and 35 plots are located within the zone of greater than 20,000 cfs. Intensive seedling counts and measurements were taken on two smaller 5 m x 1 m plots nested within the bigger plot. In-situ Level Trolls have also been placed in select locations near the seedling plots in order to monitor the extent and duration of flooding of the seedling plots. DG's study differs from the seedling plots monitored by WB Richter whose plots are located in the hardwood zone impacted by flows greater than 18,500 cfs. Ms. White's study is partially funded by FWS using challenge-cost share grant funds matched by DG; \$15,000 of FWS funds have been contributed to the study for the past three years. This year was Ms. White's last field seasons to assess the impacts of DG's operations on downstream bottomland hardwood forest regeneration.

Some of the results of the study to date are described below:

- Total seedling abundance during the initial sample increased from 2007 - 2010.
- In 2010, 66,246 tree seedlings were tallied, the most observed in any sample but only 20,047 seedlings survived the 2010 growing season.
- The highest within-year mortality (78%) occurred in 2009 following prolonged growing season flooding.
- First year seedlings represent the bulk of those tallied in all years.
- The number of germinants increased from 2007 to 2010 peaking at 58,557 in initial 2010 sample. The majority of these (21,234) were swamp cottonwood, a prolific seeder that requires bare moist substrate for germination.
- The abundance of older (>1 year) seedlings increased from 2007 - 2009, but between spring 2009 and spring 2010 abundance declined by 37% from 12,267 to 7,689 individuals
- High mortality was observed between the 2009 recount and the 2010 initial sample most likely due to a 132 day inundation period during the dormant season. However, most seedlings survived through the 2010 growing season.

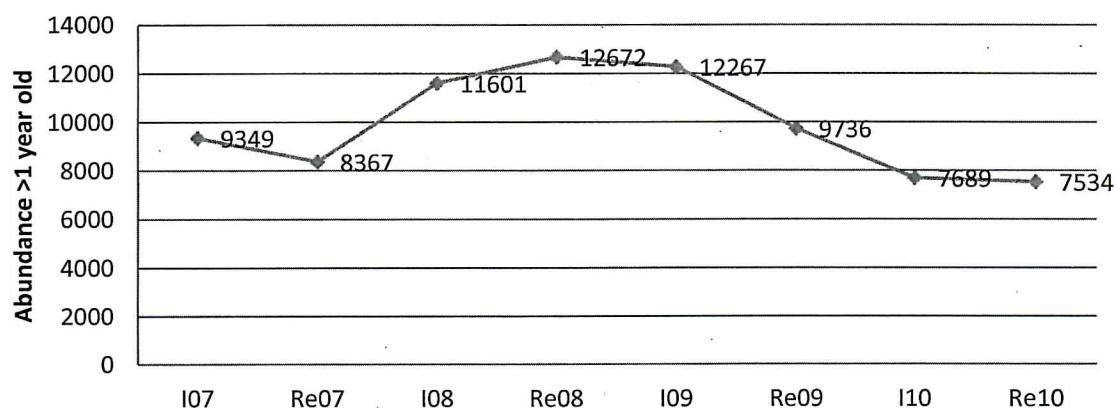


**Table 8 . Total number of older seedlings by sampling event**

<u>Year</u>	<u>Initial</u>	<u>Recount</u>	<u>Survival</u>
2007	9349	8367	89%
2008	11601*	12672	109%
2009	12267	9736	79%
2010	7689	7534	98%

\*reflects a 20% increase in sample size.

Figure 1: Trends in >1yr old seedlings (2007-2010). Note I07 is initial seedling count in 2007 and Re07 is the recount in 2007.



In 2011, the final year of the study, work concentrated on:

- Looking at trends with individual species and determine the relationship between inundation duration and seedling establishment and survival.
- Continuing to explore the accuracy of the flood inundation model using the well data collected in 2007 - 2010.
- Relating tree seedling demographics as well as changes of the species through the forest strata to deviations in hydroperiod across the lower Roanoke River floodplain.
- Sampling all plots during the 2011 growing season using the recount protocol in order to better characterize the response of the seedlings to intra-annual variation.
- Monument plots in wetter areas with rebar and pvc.

A final report of Ms. White's work was expected at the end of this year but is currently overdue. The CMT eagerly awaits the final results.

Effects of Hydropower Peaking on Benthic Macroinvertebrates - Dr. Leonard Smock, Virginia Commonwealth University, was awarded the contract to study the effects of hydropower peaking on macroinvertebrates both in-stream and in-tributaries. Background information concerning this study can be obtained from the **2007 thru 2010 Annual**

**Narratives.** This year was the fifth year of the study. The three questions being examined for the macroinvertebrate study are stated below and findings to date summarized after each.

Q1) Does hydropower peaking affect the general health of the benthic community in the Roanoke River upstream of Weldon?

Macroinvertebrate drift sampling provided conclusive evidence of peaking effects for both 2008 and 2009. Most notably, hydropeaking was associated with a large (several orders of magnitude) increase in the abundance of drifting macroinvertebrates in the system.

Q2) Is there a longitudinal effect of hydropower peaking on the benthic community downstream from the source of peaking?

No clear evidence of hydropeaking was obtained from the longitudinal sampling. Inherent natural variations in hydrology and geomorphology among the longitudinal study sites were identified as confounding factors for using benthic community comparisons among them to assess peaking effects. Therefore, the longitudinal investigation was discontinued after 2008. For 2009, time and resources were reallocated to the artificial substrate investigation discussed above.

The spatial and temporal effects of hydropeaking were examined in more detail during this year. There were 6 drift sampling events on the Roanoke River at Roanoke Rapids this year, with one of the events including simultaneous sampling at Weldon. In addition, drift samples were taken on the James River, a river with no hydropower peaking. Results of this year's work have not been completely analyzed yet. A final report was due in the fall of 2011.

Q3) Does hydropower peaking affect the general health of the benthic community in tributaries to the Roanoke River that are inundated during peaking?

For each of the three study years, macroinvertebrates were sampled in wadeable tributary streams to the Roanoke River according to the NCDENR protocol for wadeable swamp streams (NCDENR 2006). Two second- to third-order tributary streams to the Roanoke River, Quankey Creek and Looking Glass Run, were chosen based on hydrologic data from periods of normal flow and during peaking events that indicated that the lower reaches of these streams were affected by hydropeaking. Samples collected from the Roanoke River tributary sites were compared to those collected from Tyson Creek, a tributary of the Tar River, which is not affected by hydropeaking. In addition to the macroinvertebrate sampling conducted, water level monitors were installed at the tributary sites in 2008 and 2009, in order to more completely assess whether hydropeaking affected the hydrology of the streams. The water level monitoring data showed no evidence that any of the study sites were affected by hydropeaking in 2008 or 2009. In 2009, the lower (downstream) sampling site along Looking Glass Run

exhibited a water level rise that was associated with the sustained high flow on the Roanoke River mainstem that occurred during flood control operations. Macroinvertebrate sampling indicated that the downstream Looking Glass Run site generally exhibited the lowest overall ecological integrity of the study site. The results of the tributary investigation provides preliminary evidence that the macroinvertebrate communities of Looking Glass Run may be affected by hydrologic modification on the river's mainstem; however, because there was no hard evidence of this, it was concluded that work in the tributaries will not continue this year. This will allow more time and effort to be put towards looking at Questions 1 and 2.

The conclusions at the end of the five years of study are as follows: There is evidence that hydropower peaking causes a spatial and temporal attenuation drift of macroinvertebrates. There is evidence of temporal attenuation of the drift response over the hydropeaking season, with later events showing subsequently reduced overall macroinvertebrate drift as compared to earlier events. Spatial attenuation of the drift pulse was not observed over the reach from Roanoke Rapids to Weldon, most probably because the discharge pulse is not attenuated over this distance. The James River and Roanoke River differed significantly with respect to overall community structure, the proportional abundance of multivoltine and semivoltine taxa, and taxonomic richness. These differences may reflect differences in the degree of flow modification that occurs in the river systems, though these data alone are not sufficient to support a causative relationship between hydropeaking and observed differences between the benthic communities. This concludes the five-year study.

Other relicensing studies that are also underway are monitoring passage of American Eel above Roanoke Rapids and Gaston Dams and determining the feasibility of passing American Shad above the two dams. Fish passage is being handled by Wilson Laney, Division of Fisheries, FWS, and John Ellis, Division of Ecological Services, Raleigh, FO.

Dominion Generation Transmission Line Right-of-Ways (ROW) – Mr. Joshua (Josh) Wirley ([joshua.a.whirley@dom.com](mailto:joshua.a.whirley@dom.com), 434-414-6971) is the contact within Dominion Power to coordinate ROW maintenance activities. WB Richter coordinated with Mr. Whirley on the management of the Company Swamp DG ROW. This year DG only applied herbicide to the woody vegetation within the ROW.

#### *5a(2) . Intra-agency coordination*

An intra-agency agreement was set up in 2009 between the Refuge and USGS, Fish and Wildlife Coop Unit, Clemson University, for work on restoring cypress trees to the swamp forests on the Rainbow Tract. The study concluded this year. Refer to *Section 1b. Studies and Investigations "The Effects of Artificial Canopy Gap Creation on the Growth and Development of Bald Cypress Advanced Regeneration on the Lower Roanoke River Floodplain, NE NC"* for more information. Refuge staff continue to support the hydroacoustic work on migratory fish being carried out by students of Dr. Joe Hightower, NCSU, USGS, Fish and Wildlife Coop Unit. A small equipment shed is located on



Askew west to protect the computers and acrostic devices from the elements. WB Richter continued to work with USGS staff from Reston, VA on the large woody debris study. A transfer of \$5000 to USGS, Reston, VA was completed to fund travel and per diem for USGS staff and interns to collect data on bank pins and the large woody debris study.

### *5b(1) Private land activities (Easements)*

The Refuge administers 66 conservation easements by RO Tract (100 easements by Refuge Tract), several of which have been subdivided, totaling approximately 116 sub-tracts. There are 88 unique landowners involved in these easements. Several landowners within a county own more than 1 tract, NCWRC owns 8 tracts in 2 counties, and USFWS has fee title to 2 tracts in 2 counties. These parcels are located in 19 counties in the Roanoke-Tar-Neuse-Cape Fear Ecosystem. The easements total approximately 3,045 acres. The average easement size is approximately 30 acres with the largest easement totaling 346.2 acres and the smallest tract totaling 1.21 acres. The Table below shows a breakdown of the holdings by county.

To date there has been no law enforcement action by ZO Canada or SA Baker on the Orange County 13C easement encroachment/motocross activity damage from a neighboring landowner. This is the easement that was subdivided, sold with lots, and currently has nine different landowners. ZO Canada, SA Baker, PLB Smith, and RM Chappell visited easement 13C in Orange County on 11 September 2007 to assess the damage from the motocross activity and look at rehabilitation. BT Railey and WB Richter inspected this easement on 13 January 2010 and confirmed that rehabilitation was still needed. SA Baker retired in 2010; his position has not yet been filled.

BT Railey inspected 25 easements from 08/20/2010 - 08/24/2011 (compliance reports are due each year at the end of August). Of these, 24 were in compliance. RM Connolly suggested that, due to the demands of this duty, we should limit inspection to approximately 1/3 of them each year on a 3 year rotation.



Halifax County 12c2 Easement



In the two years that BT Railey has been responsible for the easement monitoring she has made it her mission to update the information in the paper and electronic files. Traveling to easement locations and determining their boundaries is now easier and less time-consuming. With the original GAP data points and easement polygon shapefile that were provided to her, she has been using the currently available technology to update current computer and software versions, add on to, and organize all the easement data. She has created GPS shapefiles for each county in a GIS mxd file that allows one to select a county, zoom onto a particular easement, and view that easement's changes over time via aerial orthophotos (the Refuge currently has aerial images from 1993, 1998, 2006, 2008, and 2010). Internet technology such as the free access to County GIS tax records and parcel maps, Google Earth, and Google maps have also improved our ability to research the status of an easement before traveling there.

Work is being done on a CD disk to accompany each county's files that will contain all photographs and GPS points currently associated with each county's easements. The GIS info is easily downloaded onto any GPS unit for use in the field. Details on all the easements can be found in the large file cabinet in the BT's office.

**Table 9. Conservation Easements by County**

County	Regional Office Tract Numbers	Refuge Tract Numbers	Number of Landowners	Acres
Alamance County	2	2	6	11.4
Bertie	1	2	1	50.32
Bladen	1	1	1 (NCWRC)	37.96
Caswell	3	3	3	101.23
Cumberland	3	3	3	140.98
Edgecombe	2	2	2	60.67
Franklin	3	3	3	119.8
Gates	1	1	1	82.2
Halifax	3	6	3	83.80
Harnett	1	2	2	42.14
Hertford	1	1	1	125.79
Martin	1	1	1	26.93
Nash	7	18	9 (Includes USFWS)	305.69
Northampton	9	11	10	241.86

County	Regional Office Tract Numbers	Refuge Tract Numbers	Number of Landowners	Acres
Orange	5	5	15	47.67
Rockingham	1	1	1	74.73
Sampson	19	35	25 (Includes USFWS, NCWRC)	1454.03
Wake	2	2	2	25.44
Wilson	1	1	1	11.93
TOTAL	66	100	88	3044.57

All easements are classified as palustrine forested wetlands (Cowardin et. al. 1979 *Classification of Wetlands and Deepwater Habitats*). Using the general wetland habitat types defined by the "Department of Environment, Health and Natural Resources 1996, *A Field Guide to North Carolina Wetlands*," the holdings include bottomland hardwoods, pocosin, swamp forest, headwater forest, and beaver swamp complex. These latter classifications should be viewed as tentative.

### *5b(2). Private land activities (Partners)*

Nothing to report.

### *5c. Cooperative/Friends organizations*

Partnership for the Sounds (PFtS) – RM Connolly and WB Richter, along with Colleen Karl, NC Cooperative Extension Office, Chowan County; Jennifer Ververka and Bruce Bowler, Bertie County STEM school; Tom Stroud and Neal Moye, PFTS Roanoke/Cashie River Center (RCRC); and a few local citizens have been meeting to discuss the Greenhouse Project at the RCRC. The purpose of the project is to get local school children, their parents, and other interested citizens involved in a community garden. Refuge Staff really do not have much to do directly with that project; however, WB Richter is working with the STEM school in propagating acorns from the fallen "Gospel Oak" tree. The tree, estimated to be at least 350 years old, fell over during Hurricane Irene in August of this year. Located near the road at the Liberty Hall Plantation home on Indian Woods Road it was considered a local landmark having great cultural significance. It was a place where Native Americans traded goods and a place of worship for enslaved and, after the Civil War, free African Americans. Five churches in Bertie County that still exist today had their beginnings under the Gospel Oak tree. To help the significance of the tree live on, EEO Wilkins and WB Richter collected acorns from the fallen tree in November. Of the hundreds collected only 28 were found to be potentially viable. At one of the greenhouse meetings, WB Richter mentioned the idea of planting the acorns and distributing them to the different churches and the landowner of the property where the tree once stood. The idea gained much support. WB Richter made contact with the Youth Coordinator from Indian Woods Baptist Church, Angela Lewis. Ms. Lewis is in support of the project. WB Richter will be planting the acorns early next

year and further meetings will be held to generate ideas on how to get the students and church youth groups involved with the project.

Roanoke River Partners – Nothing to report.

Roanoke Sponsas Society, Inc. (RSS) – There has been no activity of the friends group since 2006.

Albemarle-Pamlico Conservation and Communities Collaborative (AP3C) – This collaborative was formed in 2007 by TNC, DU, and the Environmental Defense Fund. The mission of the AP3C is three-fold: 1) Develop approaches that integrate economic and ecological resilience for the lands, waters, and communities of the Albemarle-Pamlico Region; 2) Recognize the challenges presented by economic and social distress, climate change, population change, and increasing risks to public health; and 3) Implement collaborative, sustainable solutions for well-being. The AP3C provides an open forum to identify and pursue opportunities for collaborative action among participants and to enhance the coordination of their individual projects. In other words, this collaborative provides a great opportunity to network with people working within the region who have a concern for protecting the natural resources of the region but also recognize the need for economic growth and social well-being. It allows for smart, sustainable growth in the region. There were no meetings held this year and no word as to when the next is scheduled. Let's hope this collaborative effort does not waste away.

# 6

## *Resource Protection*

### *6a. Law enforcement*

There is no permanent law enforcement presence at the Refuge. ZO Canada continues to provide limited law enforcement during Refuge hunts. Violations reported this year include four incidents of hunting violation, 6 incidents of fishing violation, five incidents of trespass violation, and ten incidents of vandalism violation. Thirteen violations were cleared by arrest or exceptional means. Vandalism violations resulted in \$2,000 monetary loss to the government.

### *6b. Wildfire preparedness*

Nothing to report.

### *6c. Manage permits and economic uses*

Nothing to report.

### *6d. Contaminant investigation and cleanup*

There is still no settlement agreement for the old Weyerhaeuser, now Domtar, pulp mill in Plymouth. The EPA, FWS, National Marine Fisheries Service, and NCWRC have been negotiating a settlement from the data collected in a Natural Resources Damage Assessment but in 2007, with new personnel in place, negotiations hit a snag. FWS Contaminants Biologist Tom Augspurger, Raleigh FO, has told us that negotiations are back on track. A final settlement may be around the corner. Known settlement items will include land acquisition of Weyerhaeuser owned lands near the mill and, if landowners are willing, the acquisition or purchase of a conservation easement on Mush Island; placement of a screen on the water intake pipe at the mill to prevent young fish and eggs from being destroyed; and the construction of a boat ramp at the waterfront at the Town of Plymouth. All the settlement items have to somehow improve fish habitat or improve public access to the river for fishing.

### *6e. Manage water rights*

Nothing to report.

#### *6f. Manage cultural resources*

Nothing to report.

#### *6g. Federal facility compliance act*

Nothing to report

#### *6h. Land acquisition*

Pamala Wingrove was hired this year as a Natural Resource Planner for the Refuges in SE Virginia and NE North Carolina. Her main task is to develop land protection plans for Roanoke River and Pocosin Lakes NWRs. Three meetings were held (14 Jul, 19 Sept, and 13 Oct) to discuss acquisition strategies for the Refuge. A draft plan was completed and is out for internal review. The Preliminary Project Proposal focuses on the land that falls within what was the 100-year floodplain of the River but, since creation of the dams upstream of Roanoke Rapids, is now the 35,000 cfs maximum release sustained. The area of acquisition totals approximately 245,00 acres with 33,000 already included in the Refuge's current acquisition boundary and another approximately 80,000 acres is under conservation by other entities so 132,000 additional acres is proposed to undergo some type of conservation protection - either fee title or easement. In addition, there is a proposed corridor connecting the Refuge to Pocosin Lakes NWR. The corridor, designed to ensure functional connectivity between the two areas, follows the Sweetwater Creek tributary of the Roanoke River then extends south and east along a path of forested lands to an intersection with an area of concentrated organic soils near NC Route 32. This corridor is approximately 46,060 acres in size.

#### *6i. Wilderness and natural areas*

Nothing to report.

#### *6j. Threats and conflicts*

Nothing to report.



# 7

## *Education and Recreation*

### *7a. Provide visitor services*

Hunting – All hunt opportunities for the Refuge are administered by NCWRC as part of the State's special hunt opportunities. Permits are drawn and issued by NCWRC. Many hunting opportunities were available on the Refuge for 2011.

Four 3-day turkey hunts were offered, as well as the annual youth turkey hunt. Turkey hunts began 19 April and ended 12 May.

Conine Island offered hunters early and late season waterfowl hunts in accordance with North Carolina State seasons. Small game hunts were offered Monday through Wednesday from 24 October - 31 December and Monday through Saturday from 2 January – 29 February.

Deer hunting was available on five Refuge tracts - Broadneck, Company Swamp, Conine-Askew, Great and Goodman Islands-Hampton Swamp, and Town Swamp. The archery season was open 10 - 30 September. Muzzleloader/Archery season was open from 1 - 14 October. Five three-day regular gun hunts were offered beginning 20 October ending 19 November. There is no accurate way to collect data on hunter show rates at the Refuge.

### *7b. Outreach*

#### Information Booths, Talks etc.

##### WB Richter

- At the request of Plymouth Mayor, Brian Roth, assisted with a river tour for the Roanoke River Mayor's Association (group consisting of all the mayors whose precincts are along the Roanoke River) of the lower Roanoke River, 21 July.
- Participated in the Martin County Cooperative Extension Field Day taking about pollinators specifically honeybees, 4 Oct.

##### OA Jager

- Presented Nature Program for Tri-County Cub Scouts Twilight Camp each evening 20-23 June
- Presented the program "My Big Back Yard" in cooperation with the Partnership For The Sounds/Roanoke Cashie River Center Summer Learning Program on



20 June, 27 June, 3 July, 24 July. & 31 July.

- Presented Nature Program at the Partnership For The Sounds/Roanoke Cashie River Center 18 October

BT Railey

- Gave a talk on Fish and Wildlife Service Careers at the Bertie Early College High School for their student Career Day, 26 May

### Interpretive Materials

Emily and Blake Scott of STRS Productions premiered the film they have been working on for the past 18+ months titled: Refuge - Roanoke River. The premier screening was held on 19 October at the renovated Turnage Theater in downtown Washington, NC. The Roanoke River film is part of a series of refuge films the Scott's have produced. Pea Island, Mattamuskeet, and Pocosin Lakes NWRs preceded the Roanoke River film. The film takes one where none of their previous refuge films have been before, deep into the swamps of eastern North Carolina. The STRS film team has captured some of the most astonishing shots ever record in this area where wildlife abounds on the unique landscape of water and land, the Roanoke River NWR. Attendance was very good with 200+ people attending. A second viewing was held in Halifax, NC, the evening before the Roanoke River Partners held their Annual Roanoke River Paddle Days; attendance was standing room only.



# 8

## *Education and Recreation*

### *8a. Comprehensive management planning*

Nothing to report.

### *8b. General Administration*

For a second year the Refuge utilized an Inter-Agency Agreement to provide travel expense funding for USGS, Reston, VA. This year the Refuge transferred \$4,500; this funding will allow USGS staff to continue work on their Floodplain Sedimentation Dynamics Study. This study will provide information on how the USACOE flood control project impacts the downstream sedimentation dynamics.

OA Jager continues to provide administrative support to Mackay Island NWR via telephone and computer contact.

OA Jager was appointed to be the Services' Junior Duck Stamp Coordinator for the State of North Carolina in April. Patty Matteson, Raleigh ES FO, resigned the position when she left the Service for a job with the US Forest Service, Asheville, NC. Raleigh FO staff helped OA Jager with the Junior Duck Stamp Art Contest judging as submissions had already been received and the judging was set for March.

EEO Wilkins continues in his capacity as MOCC instructor at Savannah and Santee NWR's.

The following is a list of employees who were members of the 2011 Roanoke River National Wildlife Refuge staff:

<u>Permanent Full Time</u>	<u>Grade</u>	<u>EOD</u>
Matthew Connolly Refuge Manager	GS-13	11-08-09
Jean M. Richter Wildlife Biologist	GS-12	05/12/96
Diana Tilghman Information Technology Specialist	GS-11	11/08/09



Doak Wilkins  
Engineering Equipment Operator

WG-10 01/04/98

Rosetta R. Railey  
Wildlife Biological Science Technician

GS-07 05/10/09

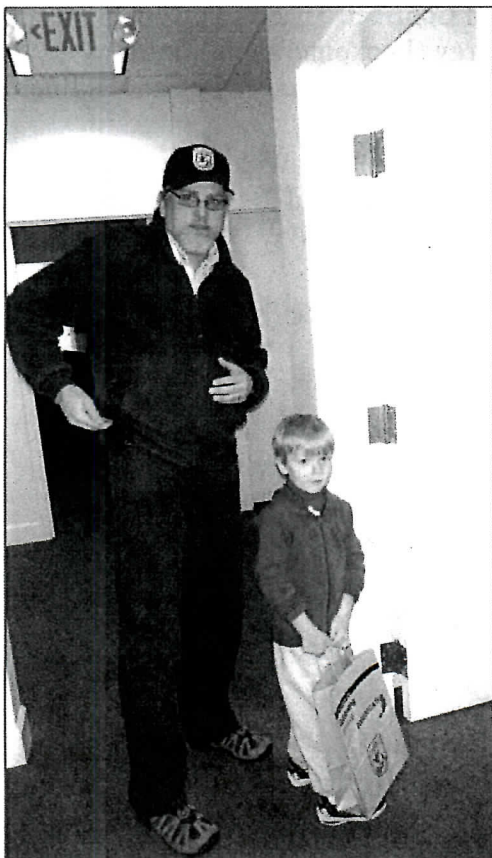
Sherrie E. Jager  
Office Assistant

GS-06 08/20/95

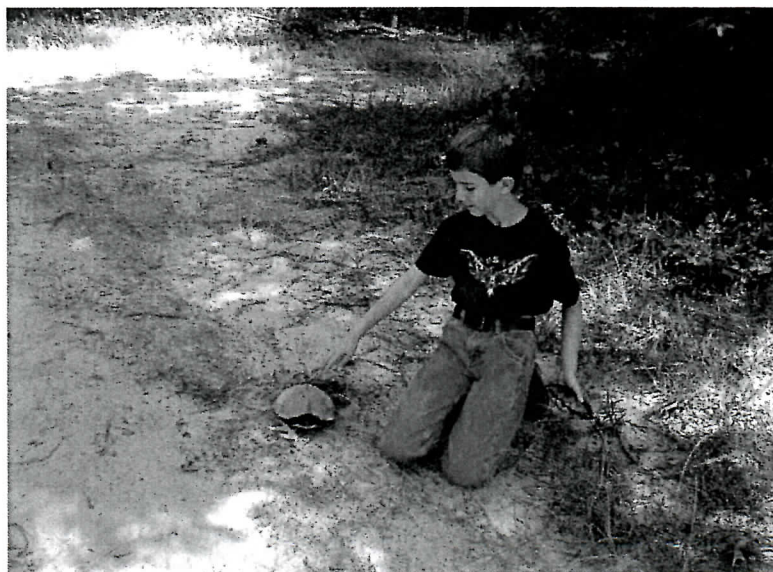
#### Volunteers and Interns-

Retired FWS employee Bob Glennon assisted WB Richter in the design and implementation of the rivercane expansion project. Jim Brown, also a retired FWS employee who resides in Williamston, assisted WB Richter in monitoring wood duck boxes.

The Refuge is very family oriented, RM Connolly's wife Julie, BT Railey's children Sam, Emma, and Nate, and OA Jager's sons Brandon and Carson all volunteered time on various projects throughout the Refuge this year.



RM Connolly & Nate Railey (son of BT Railey)



Carson Jager (son of OA Jager)

## Training

### Matt Connolly

- Federal Information Systems Security Awareness + Privacy and Records Management, Online, DOI Learn, 25 Apr
- Discrimination and Whistleblowing in the Workplace - No Fear, Online, DOI Learn, 7 Dec

### Sherrie Jager

- R4 Mentoring Program, SERO, Atlanta, GA, 22 – 25 Feb
- FBMBS Overview, SERO, Pine Mountain, GA, 14 – 18 Mar
- Federal Information Systems Security Awareness + Privacy & Records Management
- Safety: Office Safety; Intro to OSHA Standards; Walking and Working Surfaces, Fall Protection; and Hand and Portable Powered Tools, Online, DOI Learn, 28 Apr
- Safety: Exit Routes, Emergency Action Plans, and Fire Prevention Plans; Personal Protective Equipment; and Hearing Conservation; Online, DOI Learn, 29 Apr
- Safety: Excavations; Machinery and Machine Guards; and Fire Protection; Online, DOI Learn, 11 May
- Safety: Cranes and Rigging; Permit-Required Confined Spaces; Powered Industrial Trucks; Control of Hazardous Energy (Lockout/Tagout); Intro to Industrial Hygiene; Bloodborn Pathogens; Electrical and Safety Design; Online, DOI Learn, 12 May
- Safety: First Responder Awareness Level (HAZWOPER); Welding, Cutting, and Brazing; DOI Collateral Duty Safety Training Exams 1 and 2; DOI Collateral Duty Safety Officer Certification; Online, DOI Learn, 13 May
- FBMS Charge Card Process, DOI Learn, 16 May
- 2011 Discrimination and Whistleblowing in the Workplace (No Fear), Online, DOI Learn, 3 Oct
- FBMS Basic Navigation, Online, DOI Learn, 13 Oct
- Project Wet, NCWRC, Camp Boddie, Washington, NC, 22 Oct
- FBMS: L-2 Purchasing and Invoice Process; L-3 Adjusting Transactions; L-4 Property Transactions; Basic Reporting; Online, DOI Learn, 24 Oct
- FBMS: Acquisition Receiver; Custodial Property Officer; Online, DOI Learn, 28 Oct
- FBMS Field Training, Asheville, NC, 31 Oct – 4 Nov
- FBMS Master Data Course, Online, DOI Learn, 10 Nov
- R4 Mentoring Program, Closeout, Slidell, LA 3 – 7 Dec

### Rosetta Railey

- Wireless Security Training, Online, DOI Learn, 07 Jan
- NWRB Biological Program Fundamentals, WLD 2150, Shepherdstown, WV, 14 - 17 Feb
- Federal Information Systems Security Awareness + Privacy and Records Management, Online, DOI Learn, 31 Mar

- 8-hour HAZWOPER refresher training, Online, DOI Learn, 04 Jun
- Your Time and You, Online, Skillsoft, 27 Jun
- Getting Started with Access 2007, Online, Skillsoft, 26 Jul
- 2011 Discrimination and Whistleblowing in the Workplace (No Fear), Online, DOI Learn, 19 Sep

#### Jean Richter

- Mastering Microsoft Access 2007, Fred Pryor Seminars, Rocky Mount, NC, 4 - 5 May.
- MOCC Refresher, Online, DOI Learn, 2 Jun
- Federal Information Systems Security Awareness and privacy and Records Management, Online, DOI Learn, 2 Jun
- Microsoft Excel 2007/2010 Basics and Beyond the Basics, Fred Pryor Seminars, Raleigh, 18-19 Aug.
- 2011 Discrimination and Whistleblowing in the Workplace (No Fear), Online, DOI Learn, 20 Dec.

#### Diana Tilghman

- Federal Information Systems Security Awareness + Privacy and Records Management, Online, DOI Learn, 29 Mar

(Diana may have taken more training, but as Diana is not physically located at our office and has not provided OA Jager with copies of training certificates, all of her training is not available for inclusion in this Annual Narrative.)

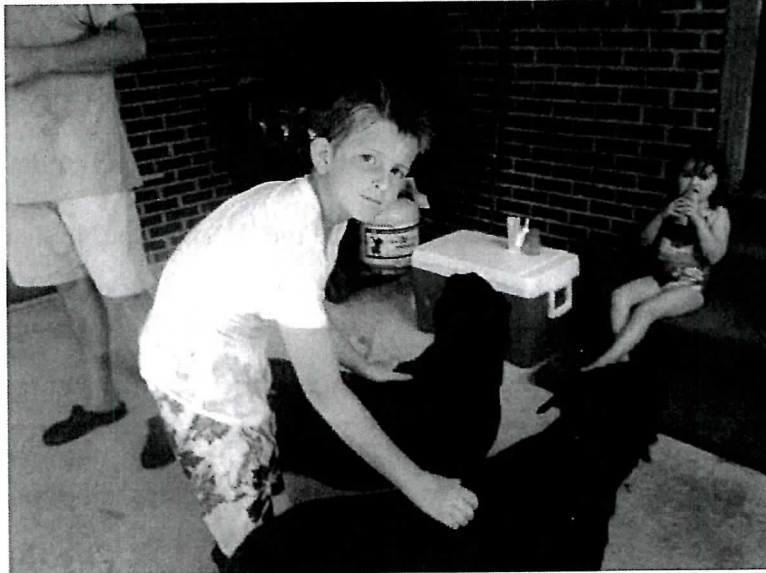
#### Doak Wilkins

- Federal Info Systems Security Awareness & Privacy Records Mgmt, DOI Learn, Online, 20 Apr
- 2011 Discrimination and Whistleblowing in the Workplace (No Fear), Online, DOI Learn, 22 Sep.



## FEEDBACK

Throughout it all, with all the ups and downs and stresses of the job, the FWS and the Refuge are truly a family. We are all much more than just co-workers, we get together as often as possible outside of work to destress, relax, and have fun with our families. This closeness and respect for each other is what helps us get through all of the bad and makes the good much more enjoyable.



**OA Jager's son Brandon pets RM Connolly's dogs as his daughter Ora enjoys a hot dog of a different kind.**



**BT Railey's Daughter Emma, RM Connolly's son Conan, and RM Connolly's wife Julie are ready to enjoy the cake!**





Always laugh at the boss's jokes! (WB Richter and RM Connolly)



RM Connolly's wife Julie and BT Railey's husband Patrick.

